BULLETIN OF THE

TAYLOR SOCIETY

A SOCIETY TO PROMOTE THE SCIENCE AND THE
ART OF ADMINISTRATION AND OF MANAGEMENT

OF CO
MAY 15 1923

How can you better invest an equivalent amount of time and money than in attendance at the Syracuse meeting?

Examine the program on page 43.

Engineering Societies Building
29 W. Thirty-Ninth St.
New York

APRIL, 1923 VOL. VIII., NO. 2

OFFICERS OF THE TAYLOR SOCIETY

President .... RICHARD A. FEISS, Joseph & Feiss Co., Cleveland, O. (1923)
Vice-President .... ROBERT B. WOLF, New York (1923).
Vice-President .... HOWARD COONLEY, Walworth Manufacturing Co., Boston, Mass. (1924)
Managing Director ...... HARLOW S. PERSON, Taylor Society, 29 W. 39th St., New York.
Treasurer .... EDWARD W. CLARK, 3D, E. W. Clark & Co., Philadelphia, Pa. (1923).

BOARD OF DIRECTORS

All the officers *ex-officio*, and
Ida M. Tarbell, New York (1923)
L. Herbert Ballou, Lewis Manufacturing Co., Walpole, Mass. (1923)
John Williams, Day & Zimmerman, New York. (1924)
Keppele Hall, The Joseph & Feiss Co., Cleveland, O. (1924)

HONORARY PRESIDENT

Henry R. Towne, Chairman of the Board, Yale & Towne Manufacturing Co., New York.

PAST PRESIDENTS

James Mapes Dodge, Link-Belt Company, Philadelphia (deceased).
Harlow S. Person, Amos Tuck School, Hanover, N. H.
J. E. Otterson, Winchester Repeating Arms Co., New Haven, Conn.
Henry S. Dennison, Dennison Manufacturing Co., Framingham, Mass.

LOCAL SECTION OFFICERS

NEW YORK

Executive Committee:
Robt. H. Wessman, The J. F. Tapley Co., Long Island City, N. Y.
Wm. H. Leffingwell, The Leffingwell-Ream Co., Flatiron Bldg., New York City.
Francis Goodell, New York City.

PHILADELPHIA

Chairman, H. K. Hathaway.
Secy.-Treas., R. H. Lansburgh, University of Pennsylvania.

CHICAGO

Chairman:
G. M. Bogue, Bureau of Commercial Economics, Inc., Chicago.
Vice-Chairman:
Hugo Diemer, LaSalle Extension Univ., Chicago.
Secretary and Treasurer:
Emil J. Schmidt, Sewell-Clapp-Envelopes, 23 N. Desplaines St., Chicago.

CLEVELAND

Chairman, Keppele Hall, The Joseph & Feiss Co.
Secretary, C. L. Sabin, Cleveland Engineering Society.
Treasurer, John D. Beale, The Pompeian Co.

NEW ENGLAND

Chairman:
Sanford E. Thompson, The Thompson & Lichtner Co., Boston.
Secretary and Treasurer:
Henry H. Farquhar, 727 Pleasant St., Belmont, Mass.

CENTRAL NEW YORK

Percy S. Brown, Corona Typewriter Co., Groton, Chairman.
Robert J. Anderson, Brown Products Corporation, Auburn, Secretary-Treasurer.

STUDENT SECTIONS

Ohio State University School of Commerce.
Wharton School, University of Pennsylvania.

MAY 10 '23
©Cl B 576694

BULLETIN OF THE
TAYLOR SOCIETY
A SOCIETY TO PROMOTE THE SCIENCE AND THE ART OF ADMINISTRATION AND OF MANAGEMENT
Published by the Taylor Society at
Engineering Societies Building
29 West Thirty-ninth St.
New York

Copyrighted 1923, by the Taylor Society. Published every other month. Per Year to Members, $2.50; to others, $3.00. This Issue $.75

Entered as second-class matter, Dec. 17, 1921, at the Post Office at New York, N. Y., under the Act of March 3, 1879.

VOL. VIII APRIL, 1923 No. 2

CONTENTS

COMMENT 41
PROGRAM OF THE JUNE MEETING . . 43
WASHINGTON NEWS LETTER . . 43
NO SAFE SHORT CUTS 44
By Henry H. Farquhar
THE MANAGEMENT MOVEMENT . . 46
By Richard H. Lansburgh
THE WAYS AND MEANS OF THE CHIEF EXECUTIVE 53
By John H. Williams
PREMIUM AND BONUS PLANS . . 59
By H. K. Hathaway
TIME STUDY 66
By Dwight V. Merrick
LABOR CLASSIFICATION AND PAY-ROLL ANALYSIS 69
By Carleton F. Brown
WASTE OF MATERIALS 77
By H. M. Sutton
REVIEWS 78

COMMENT

AN executive of a progressive and well-known English firm recently wrote us: "Speaking for myself, and I believe in doing so, I speak also for the administrative staff of this business, I have always found the *Bulletin of the Taylor Society* quite the most instructive and progressive literature that comes to us from America." Our first reaction was a glow of satisfaction; our second a blush that the praise has really not been earned; our third a resolve to increase the effort to deserve such good opinions. Whatever may be said of the *Bulletin* may also be said of the meetings of which they are a report, and we hope may some day be said of the advisory service of this office.

THE Taylor Society is what it is, and other similar societies are what they are; each has its particular part of a general mission to perform. There are some who believe that the various management societies should be consolidated, and that ultimate outcome is never absent from the minds of those responsible for directing the affairs of these organizations; but the time for that has not come. The management movement is too young; there has not yet been enough investigation of and serious thinking about management; there is no common judgment concerning the social purpose and responsibility of industry, and the policies and methods to accomplish that purpose, sufficient to draw all executives, engineers and investigators together into one homogeneous group. The individuals who are responsible for industrial operations present a great variety of temperaments, prejudices, opinions, judgments and ideals; they constitute sub-groups of the general group which respond to different leaderships and different definitions of purpose. Just as out of the friendly clash of groups of diverse political opinions there emerges political government in a political democracy, so out of a similar friendly clash of industrial opinions there emerges an industrial government—controlling ideals and an accepted technique—in industrial democracy.

DURING the ten years of its existence the Taylor Society has consistently endeavored to perform one simple task; to serve, so to speak, as a scouting unit for the army of industrial executives. It has attempted to spy out the administrative and managerial problems ahead, ascertain their nature and measure their power of resistance, and then suggest to the officers of the industrial army what strategy, tactics, detail methods and equipment should be employed to master those problems. It has at times recommended measures and methods which have been criticised as being ahead of the times, as did the man by whose name the Society feels it an honor to be known. But its appeal has been deliberately to the intelligence of executives; to the forward-looking and open-minded. Nothing it has recommended has been ahead of the times for such leaders. It has been natural, of course, that such a specialized service should not appeal to a large number, but the names on its roster stand for positive achievement in the development of better managerial methods; and while that service has not been so spectacular as to command abundant resources, the Society is rich in the privilege of realizing that ideals and methods with respect to which it has been a pioneer, are now accepted by the van-guard of American executives; and it receives an inspiration to further endeavor from the profound conviction that the ideals with respect to which it is today a pioneer, will before long be axioms of American industrial thinking.

TO be more specific, we take the liberty of pointing out the logic of the program of the Syracuse meeting, presented in detail on another page. In the scouting of the Taylor Society on behalf of the army of industrial executives, a primary and ever-present duty is to get the lay of the land, map the field of operation, define the major conditions under which the battle for industrial progress must be fought. One of the major forces to be met, and to be annihilated or adequately provided for, is the existence of cyclic changes in industry. The swing from a period of prosperity to a period of depression, and vice versa, is one of the most powerful forces conditioning the nature of industrial management; recent experience has put us in a state of mind to give attention to this major problem; therefore the opening session of the Syracuse meeting is concerned with the strategy of meeting cyclic changes. A second great problem of current interest—at a time when the industrial army is emerging from the winter quarters of depression and is disposing itself for a season's campaign—is one which combines strategy and tactics; to determine what immediate objectives may be set up, and what movements should be made to make secure the positions to accomplish those objectives; therefore the second session of the meeting is concerned with markets and selling. A third big problem—practically of strategy but chiefly of tactics—is how in detail to win the coveted ground with economy of the resources available; therefore the remaining sessions are concerned with the direction of detail technical operations—the organization and methods of the factory planning room. And the lesson of this part of the program is presented in two ways; by an analytical discussion and by the opportunity for the observation in action of two units of the industrial army which have won the reputation of having most advanced methods in technical operations.

WE have not left ourselves the space for comment on the various excellent articles in this issue. But we cannot refrain from comment on Mr. Brown's paper on "Labor Classification and Pay-Roll Analysis." When we poured ourselves out in the editorial "Producers and Non-Producers," in the October, 1922, issue—Vol. VII, No. 5—we expected a come-back from somewhere. We got it at the next meeting of the Central New York Section, where Mr. Brown presented his paper. It is a most interesting presentation of a point of view—a forward-looking point of view. But we are not persuaded that it looks forward far enough. We had presented the view in our editorial that there should be no recognition, in a standard terminology, of non-productive labor in a well-managed enterprise; that the only reason for the performance of a function is its productivity; that functions which are in the long run non-productive should be eliminated; that therefore the terms *productive* and *non-productive* should be discarded as conducive to the retention of a wrong point of view and consequently of wasteful functions. Mr. Brown presents an interesting argument for the terminology *direct productive, direct non-productive, indirect productive, indirect non-productive,* and *general,* in the classification of labor. But we adhere to the view presented in our editorial; we cannot see anything but harm in the use of the word *non-productive,* except as a term in reserve to label something which we had believed to be productive but have discovered is not, and should therefore be eliminated. We do not believe it should be retained as a part of the standard terminology for those functions which are desirable. Mr. Brown makes an apparently strong point when he says:

> If I may apply the test of productiveness on the basis of profits to an individual or to a department, I may also apply it to a complete organization, and if I so apply it, I find that a given organization in one year was productive because it made $1 of profits, and I find that in the next year the same organization with the same amount of sales is non-productive because it lost $1.

Now this is a good criticism of our use without qualification of profits as a measure of productivity. We admit that the measure must be something more fundamental than that; but we used it for purpose of illustration as the convenient first, rough measure of productivity and not as the ultimate measure. It is a good criticism also of the convenient assumption in the editorial that the productivity of an action (whether of an individual, a gang, a department, an entire enterprise or an industrial society) can be determined once and for all, or is always productive or non-productive. In a fluctuating environment a specific action may be now productive and now non-productive. The justification for an action's retention, however, is that it is in the long run productive. The purpose of the editorial was to emphasize the fact that we should recognize, by dropping the terms *productive* and *non-productive* from our standard operating terminology, that only the productive has a reason for existence; and to establish the mental attitude that any action which calls for the use of the term *non-productive* should be at once under suspicion—should be able to prove itself in the long run as productive or be cast into the junk pile of discarded elements of the productive process.

PROGRAM OF THE SPRING MEETING OF THE TAYLOR SOCIETY

SYRACUSE, N. Y., JUNE 7-9, 1923

Headquarters: Hotel Onondaga

THE next meeting of the Taylor Society is a joint meeting of the National Society with the Central New York and Southern New York Sections. The program follows:

Thursday, June 7, 2.30 P.M.—Paper: Business Cycles and Unemployment; by Wilford I. King, Bureau of Economic Research, New York. Discussion.

Acting upon a suggestion of the President's Conference on Unemployment (September, 1921), Secretary Hoover appointed a special committee to investigate business cycles and unemployment; that committee arranged with the Bureau of Economic Research to make the detail study; the full report has just been made available through the McGraw-Hill Book Company. Mr. King will sum up those results of the investigation which should influence every firm's administrative policy.

Thursday, June 7, 8 P.M.—Paper: The Sales Machine: 1923 Model; by Harry R. Wellman, Consultant on Sales Problems, Professor of Marketing at the Amos Tuck School, formerly Sales Manager of J. Walter Lowney Company. Discussion.

Good factory management requires continuous operations and employment; these require the highest quality of sales management; the period of intense competition which is immediately ahead will put a heavy responsibility on sales organizations; how are they going to meet the responsibility?

Friday, June 8, 8 A.M. to 5 P.M.—Inspection of Planning Department of the Corona Typewriter Company; including a motor trip to Groton, N. Y.

Recent articles in the *Bulletin of the Taylor Society* have interested members in the progressive methods of management at the Corona works, and this visit—a courtesy of the Corona Typewriter Company—will afford members the opportunity to observe the methods and mechanisms in detail.

Friday, June 8, 8 P.M.—Paper: The Planning Department as an Instrument of Executive Control, by Keppele Hall, Supervisor of Planning, The Joseph & Feiss Company, Cleveland. Discussion.

"Let me see the planning department and I will tell you what kind of management the firm has," said a prominent executive. "Some planning departments are planning departments in name only; others are the real thing." What are the functions of the planning department? What are the ear-marks of a good planning department? Mr. Hall will bring to the discussion of this subject long experience as an engineer and as the executive in charge of one of the most efficient planning departments in American industry.

Saturday, June 9, 9 A.M.—Inspection of the Planning Department of the H. H. Franklin Company.

The courtesy of the Franklin Company will permit guests to observe some interesting mechanisms of a most progressive management. The general description of these in Babcock's "The Taylor System in Franklin Management" has aroused the interest and curiosity of all executives.

MAKE YOUR PLANS

You personally cannot afford to miss this meeting. Your firm should send a delegation of younger executives and foremen. It is time to restore and direct into profitable channels the esprit and pep lost during the depression. Your organization will need both, to meet the increasing competition of an increasing prosperity. You do not need to be a member of the Taylor Society to be cordially welcomed.

MAKE YOUR PREPARATION

Reserve the dates—June *7-9—now.* Write *at once* for reservations at the Hotel Onondaga, Syracuse. Make a tickler memorandum to secure railroad reservations *by June 1.* Note: Syracuse is the focal point of a number of fine automobile trunk lines—let your imagination complete the suggestion.

WASHINGTON NEWS LETTER

Washington, D. C., April, 1923.

IN marked contrast to the doubtful attitude of Government officials toward scientific management when Mr. Taylor testified before the Senate investigating committee in 1911 are the developments of the past eighteen months. Beginning with the survey of waste in industry initiated by Mr. Hoover, and completed shortly after he became Secretary of Commerce, right down to the passage of the Employees Reclassification Bill during the closing hours of the 67th Congress, several events have occurred which reflect not only an increasing interest in scientific management principles, but also actual application of those principles to current problems, and to some extent, direct participation in that application by members of the Taylor Society now in Government service.

The President's Unemployment Conference of November, 1921, studied the basic causes for unemployment, and in its report recommended several corrective measures which are consistent with the objects of our Society. The study of the business cycle, of which the report will be available this month, has emphasized the need for more comprehensive study and wider application of modern management principles. The investigation of the coal industry has shown by the statements published to date, that improved managerial practice as well as revision of basic policy in keeping with the policies of more stable industries, is essential if not imperative.

In the Department of Commerce there have occurred major developments in the presentation of statistical data showing the trend of business movements, with the result that executives in industry are given more facts at more frequent intervals, thus enabling them to visualize the future with greater accuracy. Commercial research, or market analysis, with regard to more effective foreign distribution of American products is proving a very real service to sales managers in many lines. An increasing amount of technical research and scientific investigation, being carried on by the Bureau of Standard in cooperation with various industries, is leading to improvement, refinement, and standardization of products, with increasing prosperity for those industries which recognize research as essential to balanced growth.

Those of you who recall Secretary Hoover's address on "Industrial Waste" (see *Bulletin* for April, 1921, p. 77) may be interested to hear that through the Division of Simplified Practice, which the Secretary of Commerce established to assist industries in solving problems of waste, simplification is being accepted by nearly a hundred different industries as the first step toward true conservation of materials, labor or human energy, time and money. Paving bricks have been reduced from sixty-six to seven varieties and sizes, beds have been reduced from two hundred sizes to one standard length and four standard widths for wood beds and two for metal beds. Springs and mattresses are being made to conform. Weights and varieties of metal lath are being reduced from over eighty to twelve. Milk bottles, formerly made in over one hundred sizes are being standardized with three heights for quart bottles, three for pints, and three for half-pints, with one standard cap size to fit them all. A. W. Shaw, formerly Chairman of the Conservation Division of the War Industries Board, who addressed the Society at its December, 1920, meeting on "Standardization," is a member of the Planning Committee which is broadcasting simplification to American industry.

The proposed reorganization of Federal departments has for one objective the grouping of bureaus and divisions by related functions, and when effected will facilitate economical government operation. The establishment of budget control of federal expenditures is a particularly significant instance of improved management in the business organization of the Government. The proposed consolidation of the railroads points to the elimination of waste in transportation, and more effective use of existing facilities to the end that the distribution of commodities may be more efficiently accomplished. The findings of the Joint Commission of Agricultural Inquiry as published in Report 408, especially Part IV, on "Marketing and Distribution," are in themselves a most excellent indorsement of modern management principles.

There are numerous other evdences of similar nature, but space will not permit their enumeration. The one outstanding fact is that Taylor's vision of scientific management is now being recognized as vital to the present needs of our country; and that his principles afford a sound foundation for planning those measures and activities which shall insure the future growth and prosperity of America.

RAY M. HUDSON.[1]

NO SAFE SHORT CUT TO HIGH PRODUCTION MANAGEMENT.

IT is comparatively easy in almost any manufacturing plant to secure increased production—for a time. The engineer who values his reputation, however, and the manager of the plant who is looking for long-time results, must constantly ask themselves the question, "Is this method which I am developing such as will result in *permanent* satisfaction?" Too many well-intentioned attempts to secure high production management result in disastrous failure through an attempt to introduce merely short cuts.

I believe that when the movement for modern methods of industrial administration, commonly referred to as "scientific management," comes to be dispassionately analyzed some time in the future, one of its fundamental lessons will stand out in unmistakable clearness —the fact that *there is no safe short cut to high pro-*

---

[1] Division of Simplified Commercial Practice, Department of Commerce.

√

duction management. As a corollary, the whole experience with this movement unmistakably teaches that incentive methods of payment of workmen cannot be substituted as a short cut for the careful development of the many factors which make for high production, high wages, and low costs.

No one thing has contributed more to the short life of so many serious attempts to develop better methods and served so effectively to discredit the whole movement for modern management, as has the introduction of incentive payment by opportunist engineers, without properly paving the way for it; and every such failure, doomed from the beginning, has reacted to the detriment not only of the individual plant but of the movement as a whole. The manager who yields to the temptation to attempt such short cuts is simply storing up trouble for the future.

A detailed enumeration of the fundamentals of good industrial management would require volumes. In outline, however, they group themselves under the following functions, upon which permanent improvements must rest:

1. *The Determination of Standards.*

The determination of the best way of performing work and of enforcing this way in practice until a better one be found, is the foundation upon which has been built such lasting betterments as we like to associate with the true conception of what modern management stands for. Just as surely as an appeal to the workmen has been made before machines, materials, methods and procedure have been standardized, has trouble arisen when the workmen found a way, as they easily have in such cases, to improve methods and either make disproportionately high wages or deliberately limit output and earnings to what they felt the management would stand for. A revision of rates, necessitated when they are based on an insecure foundation, has sooner or later led to distrust and lack of confidence in the management, if not to actual labor troubles. The wise manager will not camouflage such revisions through a conversion of the allowed or standard time into other more roundabout expressions; the workmen will very soon put such attempts down for exactly what they are.

2. *Planning and Preparation.*

Where attainable results have been permanently secured in any given case, the work to be done has been as carefully planned in advance as was practicable, so as to secure maximum use of all facilities; and the preparation of all materials, tools, instruction, and so forth, has followed as a matter of prime importance.

3. *Scheduling and Dispatching.*

It has been realized that the accuracy with which work could be scheduled, delivery dates lived up to, and work in process and costs reduced, depend directly upon the carefulness with which standards have been set and with which plans and preparations have been made.

4. *Inspection.*

Careful inspection has followed as a matter of course, particularly where incentive methods of payment have been introduced.

All of these things simply mean that the wise manager has not expected to get something for nothing, because he knew that if permanently beneficial results were to be secured from the development of new methods of management and the installation of new methods of paying workmen, all of these functions must first be adequately handled in preparation for them. This preparation, furthermore, has been distinctly imposed upon the management, for the results could be satisfactory or eventually disastrous, only according to the thoroughness with which the management's part is played.

A slight analysis will show why incentive payment should ordinarily be the last thing to attempt in installing new methods of management:

1. It has been the general experience of those who have had most to do with developing high production management in various industries, that of the increase in production resulting from modern methods, probably less than 25 per cent on the average is secured thru additional effort on the part of the individual operatives themselves. Over three-fourths of a reasonable attainable pick-up, in other words, must come from sources other than the workman.

2. The direct labor cost in most industries forms less than 40 per cent of the total cost. The balance consists of the cost of materials used and of the cost of overhead expense, or burden. It is a fair assumption, then, that of the practicable cost reduction thru such methods (which often runs up to 25-40 per cent or more of previous total cost), only 25 per cent of this 40 per cent, or only 10 per cent of what is reasonably possible, can be secured by extra effort on the part of the operatives themselves.

3. The incentive method of wage payment is essentially an appeal to the workman to put forth his best efforts toward high production. In essence, it is saying that the management proposes to pay him not simply according to time put in, but primarily for amount of

(*Concluded on page 77*)

THE MANAGEMENT MOVEMENT[1]

By Richard H. Lansburgh[2]

COINCIDENTLY with the rise in interest in management matters among the general industrial community there has been developing what may best be termed "the management movement." This movement, which involves personalities, has been progressing together with industry and yet separately from it, actuating industry almost from without. Although attention to operating methods has outlined for us broadly a true era in industry, yet by considering this management movement separately it will be best possibly to trace definitely various stages and paths in the changes that have been going on. Before discussing management methods, with the few thoughts already presented on what management really is and its broad historical background in mind, a discussion of this management movement will aid definitely in clarifying issues, and possibly to some extent in eliminating doubts.

2. The management movement would have come about within a period of perhaps a quarter-century. Of that we can be certain. It had a firm foundation of necessity, and what that foundation was we have already ascertained. However, the exact form of the movement and its starting place was, as is not unusual, determined by the life work of a great man, who, seeing around him the need for the development of management, even as probably many other men saw it, was not content merely to sit and look on, but began the intensive study of corrective measures, which finally led to the development of the science of management, of which he is recognized as the founder.

3. Whatever branch line the management expert may be working in at the present time, or whatever methods he may use in his particular development of the science, the true expert, who has studied the history of the movement, as well as the detail of method, will always gladly say that his work is but the development of the foundations laid between 1880 and 1890 by Frederick W. Taylor. Taylor was the man with the vision, the father of modern scientific industrial management, not only in the United States, but throughout the world. There never has lived a man whose individual work so largely influenced the operation of so many plants in so many and diversified industries as did the work of Frederick W. Taylor. His first work was small in itself and finally largely voided by opposing factions in the organization. His influence, though not dormant, was both consciously and unconsciously disregarded for twenty years, and yet his influence in developing management methods has been greater than that of any other single man.

4. Dr Taylor was himself strongly influenced when still comparatively young, by knowledge of the work of Mr. Henry R. Towne, President of the Yale & Towne Manufacturing Company, who began the application of new management methods as early as 1870 in the plant of that company. It was probably the example of Mr. Towne that caused Dr. Taylor to direct his efforts to the organized study of management as a science and as a profession. But, although Towne may have been the pioneer, Taylor was the great leader of the movement. At the time of Dr. Taylor's death, Mr. Towne himself referred to him as "one of the world's discoverers and creative leaders," and as "the creator of a new science."

5. In 1882, after transferring from the offices to the shops of the Midvale Steel Company, in Philadelphia, Taylor was promoted to machine shop foreman in the Midvale plant. During his previous experience as a workman, Taylor had been constantly impressed by the failure of many of his fellow-workers to produce more than a third of a good day's work. Wages had been on a piece-work basis, and the men were afraid to let the management know how much work they could really do, for fear that the rates would be cut. When Taylor became foreman, he was determined to work out some system of management by which the interests of the management and the men might be made as nearly as possible the same.

---

[1] Outline No. 3 of the syllabus used in the course in management, Wharton School, University of Pennsylvania. Copyright by Richard H. Lansburgh.

[2] Assistant Professor of Industry, Wharton School.

6. The constant thought in the mind of Mr. Taylor in those days was that the difficulty at the root of the whole matter was lack of knowledge of what actually should constitute a day's work. How could the man be held accountable for his full duty when the management had no idea of the man's capacity? It was on this thought as a foundation that most of his writings, researches and influence over other men were erected. He found that management did not really manage. It would be necessary to entirely change its attitude towards its responsibilities in this direction before it could be expected that the workman would change his attitude with relation to his work. Taylor felt that the management was asking the worker to do its own work as well as his own. Taylor's efforts to secure information at Midvale, concerning ways in which management might really manage, enabled him to develop what he termed the "duties of management" that guided him and many others along newer industrial paths. These duties were changed in phraseology by Taylor from time to time, but their substance was as follows:[1]

7. First: The development of a science for each element of a man's work, thereby replacing old rule-of-thumb method.

Second: The selection of the best worker for each particular task and then training, teaching and developing the workman; in place of the former practice of allowing the worker to select his own task and train himself as best he could.

Third: The development of hearty cooperation between the management and the men in the carrying on of the activities in accordance with the principles of the developed science.

Fourth: The division of the work in almost equal shares between the management and the workers, each department taking over the work for which it is the better fitted; instead of the former condition in which most of the work and the greater part of the responsibility were thrown on the men.

8. Taylor remained at Midvale until 1890. While there he carried on also early experiments in the development of high-speed steel. His discovery of this product, together with Mr. Maunsel White, ranks as an achievement equal to the founding of the modern management movement. The work which he did on high-speed steels was in fact an outgrowth of his attempts to find the right way to do jobs. When Taylor left Midvale it was largely due to factional differences within the organization and this fact naturally led to the undoing of much that he had accomplished. Nevertheless even today many of the practices in the machine shops of this plant can be traced directly back to the time that Taylor was first working with management methods there.

9. For several years Taylor did not have an opportunity to carry on, upon a large scale, the work that he had begun at Midvale. Though engaged in a number of undertakings in which he aimed to improve management methods, several of which, by the way, were largely concerned with improvements in cost accounting, there was no one great work carried on in one plant.

10. At the Bethlehem Steel Company, beginning in 1898, for three years, with the assistance of a large and competent force of assistants, he reorganized the management and methods of two of the larger machine shops and the foundry, and at the same time completed the development of his metal-cutting experiments. It was at Bethlehem that interesting studies of pig-iron handling and shoveling were made which since have become classic in the field of management. One of the more important of the wage-payment systems was also developed during this time. Taylor's early experimental work in management can be said to have been on the same sound scientific basis as his metal-cutting experiments, and any task which he attacked was handled by him in the same manner. This fact accounts for the fundamental nature of his conclusions. As an evidence of the type of work he carried on, Taylor once stated in connection with his metal-cutting experiments that he and his associates had made nearly fifty thousand recorded experiments and many others of which no record was kept. In studying the laws of metal-cutting there were cut up under his direction more than 800,000 pounds of iron and steel. His experiments in management were conducted on the same scale.

11. After Taylor had been at the Bethlehem Steel Company for about three years there was a change in the directorate and executive management of the company. The group who came in were unfamiliar with, and apparently antagonistic to, the methods pursued by Taylor and his staff. Taylor and his associates left. This withdrawal was followed by changes in methods by the new management, and since it so closely followed the upheaval at Midvale it cast a shadow on Taylor's work which it took some years to live down. This very largely accounts for the slow development of his ideas during the immediately succeeding years.

---

[1] Principles of Scientific Management, F. W. Taylor, Harper & Bros. Pp. 36 (1919 edition).

The manufacturing community as a whole, if not actively hostile, were at least reluctant to give a trial to ideas which had been practically discarded at two of the largest steel plants in America. But Taylor's work had trained a number of disciples, who thoroughly believed in his ideas and work, and there naturally were enough manufacturers who were interested in these new ideas of management to allow for a steady, if slow, growth in the application of these management principles during the succeeding decade. Among the more important plants in which Taylor or his direct associates worked in this period were the Tabor Manufacturing Company and the Link-Belt Company of Philadelphia and the United States Arsenal at Watertown, Mass.

12. Shortly after the beginning of the twentieth century, Taylor withdrew from actively installing management methods and began to philosophize and generalize on his experiences. The far-reaching significance of his principles and methods became clear to him and he began the task of transmitting them to others through writings and addresses. His writings of this period have become the very foundation of modern management literature. The first and best-known of these is "Shop Management." The book was first published in 1903 under the auspices of The American Society of Mechanical Engineers, having been read at a meeting of the society in June of that year. In December, 1906, Taylor presented as his Presidential Address to the same society his other masterpiece, "The Art of Cutting Metals." From that time until his death on March 21, 1915, he devoted himself almost completely to the task of spreading the gospel of scientific management.

13. After Taylor gave up the active practice of management installation, there quickly appeared a number of his direct followers to carry on his active work. Among the leaders of these, who have also made real contributions to the art and science of management, may be mentioned Henry L. Gantt, Carl G. Barth, Morris L. Cooke, Sanford E. Thompson and Horace K. Hathaway. These men have become known as the "Taylor School" in management methods work because their close association with the leader of the movement has caused them to be largely guided in their work by Taylor's own methods. The influence of Taylor was guiding, at this same time, other men in distant parts of the United States, and even of the world, along paths which led to the same goal, but nevertheless took somewhat different courses in reaching it. In the hope of avoiding some of the pitfalls that Taylor's detail methods had fallen into at times, these other methods which were developed, frequently seemed radically different from those of Taylor. As to devices utilized they sometimes were different, but the principles they aimed to reach were his, although the executive might not always have been conscious of this.

14. Taylor's position in the management field is that of the first explorer. His researches, because of his personal ability, carried him personally further than might have been expected. Unfortunately, his abilities did not include that of selling his work in toto to many besides those most closely associated with him, who were always able to see the careful thought and study behind all his conclusions. Being the leader, and years ahead of the industrial community, he has had associated with his name some of the most violent opposition to the introduction of new methods in operation. This became particularly true because he was the first exponent of a cause which, though it has not grown beyond his imagination, has, as he most of all would wish, grown beyond the control of his immediate followers and his or their particular methods.

15. The public, and even the large majority of factory executives, especially outside the metal-cutting trades, had not had their attention focused on scientific management by any of the early work of Taylor or the development work of the Taylor men or others. Although there had been a general tendency towards improvement in management method, in 1910 but little was known of scientific management. In 1911 thousands had a general idea of what it meant, although their concepts were necessarily frequently warped.

16. This change came about through a startling announcement made by Louis D. Brandeis during hearings before the Interstate Commerce Commission, late in 1910, concerning certain railroad rate increases. Justice Brandeis, who at that time took the aggressive against the proposed increase, stated that it was unnecessary because if the railroads of the United States should adopt scientific management the rate increase would be unnecessary. He explained that by this method a saving in operating expense could be accompanied by an actual raising of the wages of the railroad employees. In the same hearings, Harrington Emerson, an installer of management methods who had had wide experience in the shops of the Santa Fe Railroad, stated that the railroads could save $1,000,000 a day by paying greater attention to efficiency of operation. These two statements, both coming from men of un-

doubted reputation, were given wide publicity and electrified the entire country. The general public of the country was as interested then as now in lower railroad rates and this new talking point against increases was more than interesting to them. It was peculiarly fortunate for the growth of the management movement that public attention was first focused upon it in connection with an industry in which the public was so vitally interested and concerning which it came into such daily contact as railroading.

17. Only a few days after the introduction of the evidence the early December magazines gave much space to the dramatic testimony of the witnesses, and proceeded to give accounts of what scientific management was and what the results of its installations had been. Arguments began, debating societies debated the question, industrial executives were quoted as to why they thought scientific management was good or worthless. In March, 1912, the first "efficiency" society was organized in New York for the purpose of applying the scientific management principles of "efficiency" to every department of life, and scientific management as an element in the industrial life of the United States had come to stay.

18. Modern management shortly came to be known under the term "efficiency" and interest in "efficiency" became so widespread that it nearly caused the death of the management movement. It did retard it. "Efficiency men," fakers in every sense, who promised short-cuts to profits through panaceas, and whose knowledge of management was as shallow as their vision was narrow, sprang up over night. They managed to kill the word "efficiency" in American industry most promptly, and they nearly permanently injured the management movement. They failed for various reasons; first, they usually had no knowledge on which to base their efforts; second, if they did have the personal experience to qualify them, they usually lacked the broader concepts which would have permitted their work to be successful. They did not pay sufficient attention to the workers' point of view and they did not or would not cooperate with the regular organization. They tried to run rough-shod over the older members of the organization until the title of "efficiency man" became everywhere the key-word for concerted opposition. Recently the "consultant in management," with far different ideals and qualifications has replaced the "efficiency man," with very effective results.

19. Another retarding influence on the growth of the management movement at this time was the fact that all the literature on the subject concerned the metal-cutting trades. When a manufacturer in another industry became interested in modern management and began to read Taylor's writings, or those of his co-workers, he soon discovered that everything definite about modern management was expressed in terms of metal-cutting. It was, therefore, but natural that they failed to look under the surface of the devices and terminology employed at the principles involved, and said that "it didn't apply to them." It was still to be some years before this difficulty was to be even partially overcome.

20. In the general growth of the management movement the leadership that had been Philadelphia's was largely lost. Sections of the country which were less conservative along lines of management method took to the new ideas more readily and in larger proportions than did Eastern sections. New industries which were developing, such as the automobile and allied industries, had a made-to-measure opportunity to develop management method along with manufacturing technique. These were largely located in the Middle West. The Middle West grasped at the opportunity of increasing effectiveness of operation that was offered by management method, and gradually developed, in many scattered localities, methods of operation which, though built up on the same firm foundations as those which served the early leaders of the management movement, were nevertheless constructed along newer and bolder lines. Of the examples of this work, the best known is that of the Ford Motor Company, whose examples of the economies incident to standardized operation, continuous assembly and newer wage-payment methods have profoundly influenced the whole of American industry.

21. At the time that the United States entered the world war the management movement may be said to have been in a condition of deflated interest but gradual growth. The necessities that were outgrowths of our entrance into the war quickly changed this situation to one of awakened interest and rapid growth. The declaration of war by the United States, in April, 1917, made it incumbent upon this country to organize itself for the prosecution of the war immediately and effectively. It meant the organization of the industries of the nation for the one common purpose. Without attempting to lay blame, or to decide whether there was blame, it is nevertheless true that in the several years of the war prior to America's entry into it, nothing had been done towards getting American industry ready

to shoulder the war burdens, other than working upon the European orders which certain American manufacturing plants had received, not as a matter of government policy, but generally almost contrary to the government policy. It was, therefore, found necessary at the beginning of our participation to start from the very ground in organizing the nation for war production. Government arsenals could supply but a small fraction of the war materials which were immediately needed.

22. Those who were in control of government supply bureaus very quickly found it to advantage to employ for the organization of war-time industry men who had made a business of organizing peace-time industry. It was, therefore, usual to find in Washington that the men who were taking active charge of the expansion of those bureaus were emergency men, brought in for that specific purpose, and the regular government officials were contenting themselves to the lending of these men advice on governmental procedure, or the execution of such procedures as might be developed. This was even more true in the organization of industry to aid the government than it was in the reorganization of the bureaus themselves. The men who were brought in to do this work were proven executives, and there was a scramble among the supply bureaus for those men who had proven themselves competent in the distinct field of management. Practically every man who had ever written an article on management was to be found connected with one or the other of the government bureaus before the war was two months old. In this attempt to secure the management talent of the country it was unfortunately true that some of the bureaus were not in a position to select the capable men from the incapable, but nevertheless there was built up quickly a corps of management experts, such as had never before been gathered together. These men, accustomed to the freer ways of the business world, frequently chafed under the binding restrictions of governmental red tape, and therefore, kept constantly in mind the performance of old tasks in new ways.

23. Brought into contact with these men at this time were hundreds of other industrial men, called also into government service, who as yet had not come directly into contact with the management movement. These men became the aides to or cooperators with those of wider modern management experience and soon came to have first-hand knowledge of their methods. Although it is true that some of these men returned to industry with rather a horror of attempting the newer methods, the usual reaction was otherwise. To most of these executives the war became an apprenticeship in the ways of modern management, the knowledge gained being directly utilized after their return to industry.

24. The effect of the war in changing operating methods in American industry and causing a rapid growth in the management movement can hardly be overestimated. Reference was made in the previous chapter to the effect on plants forced out of time-worn ruts by the war. The same effect was experienced by executives as individuals. As the production forces of the government were demobilized, executives returned to their peace-time tasks with new ideas and new concepts, and, above all, jarred out of the habit of doing the same thing in the same way day after day for years.

25. The war served the management movement in another way. It broadened the very men who had been the leaders in the movement in prior years. Particularly is this true of the attitude of the manager of the worker. Whereas much of the opposition to scientific management had been from the worker, because he felt that it was but a further attempt to deprive him of some of his traditional skill, previous to the war, management men had a tendency to regard this as merely one more barrier to be overcome, and not to deal with the fundamentals of the situation. The broadening powers of the war seemed to aid this situation somewhat. Management men seemed now to possess a more fundamental concept of their position towards labor, and with rather a feeling of trusteeship of the rights of labor as well as a trusteeship of the rights of the owners of a business, which they had long felt. This has developed side by side with the growing feeling of the importance of the human factor in industry, previously referred to.

26. There has also developed an appreciation of the difference in reaction likely to be experienced from the workers as various phases of management work are undertaken. For instance, one management problem to which much attention has been given in recent years is the lighting of the workplace. If the manager is seeking to improve the lighting of the workplace, he will find no opposition from any worker or body of workers. He may receive requests for better lighting from the workers, but there will most certainly be no permanent objection imposed to the changing of light conditions in the shop for the better. This is representative of the type of change where the manager is sure

of the full cooperation of the worker, and the type where he will expect no marked opposition.

27. On the other hand, another of the problems of the modern manager is to ascertain just how much production should be attained by an average worker in a given space of time. This knowledge is fundamental in a large number of the decisions of the manager. To secure this information there has been devised the taking of time-studies usually by means of the stop-watch. Large numbers of laboring men, and particularly labor organizations, have expressed their disapproval of the taking of time-studies. It would be foolish to think of the taking of time-studies without the full cooperation of the worker, and yet the manager here is likely to find himself bitterly opposed by the worker. So his management problem in this case takes on an entirely different aspect from the one of improving the lighting of the work-place. In both the human factor must be regarded, but from entirely different angles.

28. Since the war the spread of the management movement has been extremely rapid and the development has been along what seem to be comparatively sound lines. "Efficiency" has passed on and in its stead has come soundly developed management work that considers the fundamentals of all problems, that is based on long perspective, that takes into account the necessities of both booms and depressions. Management has become the profession of the plant executive, not merely the profession of a few who specialize in it. Those who do specialize in management fit into the scheme as specialist cooperators with the managing executives of industry. The consultant in management has become firmly intrenched as one of these specialist cooperators. He fills a very real, although a new niche in the halls of industry. He is a combined product of the age of management and the age of specialization in industry. He specializes in management and sells his services, either along general or specific management lines, to the executive who is in charge of the enterprise. He brings to one plant the knowledge of many, and he serves to rehabilitate run-down concerns by bringing in the refreshing stimulus of an outside viewpoint. He serves the same purpose as does the blood-transfusion operation at a hospital, and at the same time his greatest work is carried on before the patient-concern gets to the point of weakness such as characterises the hospital patient who undergoes the blood-transfusion.

29. The specialist, or consultant, in management is not the only expert who is a product of recent development in industry. He has come in after the certified public accountant, who occupies practically the same position in the accounting field that the consultant in management does in the managerial, and his advent is not so recent as that of the income-tax expert, whose duties frequently partake more of the legal nature than they do of the accounting. But some of the more recent developments in the field of industrial consulting have become rather specialized. For instance, there is the type of industrial consultant who advises only with regard to the construction of a new building or the remodelling of an old one, specializing in such matters as the type of building construction, fire hazard, and the routing of the product through the factory. Or there is the still more recent development, the outgrowth of the labor conditions just referred to, of the consultant who deals only with labor matters. There have been mushroom consultants spring up who are but remnants of the efficiency man, but in the main the consulting field is developing along far sounder lines than did the efficiency movement.

30. Together with the growth of the consultant in management, has come the growth of the idea of having an "inside man" in management. This inside man is a specialist in management who is continuously on the payroll of the employing concern, and who performs the same type of tasks as the consultant. He has no particular duties connected with the actual administrative work of the concern, but acts entirely as a specialist in management, advising and installing new ideas. This development seems in some respects to many to have more possibilities than the development of the consultant, as the latter frequently has to spend so much time in the plant in order to be familiar with local conditions, as to become himself almost an inside man for the time being. If he does not devote that great an amount of time, he is apt to have a high percentage of error in his decisions.

31. In the business depression which began in the late months of 1920, the management movement found a blessing, though at the time it did seem as a blessing to be considerably in disguise. Soon after the beginning of this depression, factory managers being forced to reduce operating costs to the very minimum in order to be able to survive, frequently eliminated production, personnel, or other similar staff departments which have been usually looked upon as part and parcel of the management movement. These departments were usually eliminated with regard for only one factor, imme-

diate pay-roll necessities. For a time it looked as if such adjuncts of management work were only fair-weather factors. As the period of most severe depression passed and prosperity began slowly to return, it was found that frequently that which had been eliminated from an organization could well be spared, that it was really an after-war overdevelopment of a good principle, badly worked out. But plants found out that they needed personnel departments and production departments, if they were established on a sound basis. Examples of well-managed plants that had weathered the storm best of all, through low inventories and quick turnovers made possible through highly developed organizations, came to be well-known, and the sound basis of management work as applied to a particular plant came to be better understood. The feeling that correlation of various departments within a business was of primary importance and operating methods within the departments come afterwards was a distinct outgrowth of the experiences of many plants during the depression. Labor, even union labor, frequently previously hostile to management developments because of misunderstandings or poor operating methods in particular plants, came to be more friendly because of the depression. It saw that there was less unemployment in better-managed plants, less wild wage-reductions, more sympathy for the point of view of the worker from the executives who were working in accordance with modern management principles. All in all, the depression served to squeeze the water out of the management movement and to put it on a firmer, sounder, more appreciated basis in all portions of industry.

32. The management movement has progressed remarkably when its youth is considered. It has grown rapidly from the early beginnings of Frederick W. Taylor, and it seems destined to continue to grow because of the logical trend to operating methods which we have seen is a fundamental condition in American industry. There are a number of factors which are combining to insure steady progress in the development of the field of management. Among these are the growth of societies, whose membership is largely plant executives and whose interests lie entirely with management problems, the increasing literature, both periodical and book, on management subjects, and the attention being devoted by the next generation of factory managers, now in educational institutions, to management as a study.

33. Just as the growth of scientific education in colleges during the last fifty years has aided in revolutionizing American industry, so the growth of management education is likely to aid the management movement in further revolutionizing it. Ten years ago there were not five courses in management given in American universities. Today practically every business and engineering school in the United States is offering courses in Management. While this extremely rapid growth of management instruction has been in response to the demand from industry, yet in many cases it has led the demand, and has, through its graduates, called the attention of industry to the strides that have been made in management in other sections of the United States. It must be put down as one of the most important developments in management in recent years. Particularly is this true in the instances where industry and the colleges have cooperated in management education, for in practically every case where this has occurred, the combination of practical and theoretical instruction has resulted in very distinct advances in the management field.

34. Probably the best criterion for the continued growth of the management movement is the interest of the general public in management matters. Management literature is no longer confined to technical publications, but a large portion of the public is informed of strides towards better management through the columns of the daily press and popular periodicals. Each time that public interest is threatened through some industrial upheaval such as a strike in a basic industry, editorial comment points directly to industries and factories where better management has solved similar problems. The general public, as well as the enlightened factory manager, is coming to know that a solution of a specific controversy between employer and wage-earner lies deeper than mere adjustment of the problems immediately incident to the particular difficulty. It is coming to be daily better understood what the hidden forces are which make for smooth and effective operation of industrial establishments, and that these forces, though sometimes highly technical in their development, must be successfully coordinated by what is known as management to bring about industrial betterments and the industrial peace so sought after.

SPRING MEETING

Hotel Onondaga, Syracuse, June 7-9

Program on page 43

THE WAYS AND MEANS OF THE CHIEF EXECUTIVE[1]

By John H. Williams[2]

IN speaking of the ways and means of the chief executive, I shall try to avoid coufusing them with his problems. A problem implies a question of judgment such as the adoption of one means or another. I shall try to avoid advocating any particular means for the solution of any particular problem and to stress the desirability of certain means as having an integrity of their own apart from their application to a given problem.

On this basis the first means of the executive may very well be the recognition of the alternative types of management through which he may function, the selection of one or another of these, and consistency to the selected type of management in all that he may do.

Nothing is more important than morale and nothing will destroy it more quickly or more effectually then inconsistency in those things which characterize different types of management.

By type of management I mean the disposition or tendency for or against such matters as:

The subdivision of duties and responsibilities on the basis of function or of personality of executive.

The lodging of final authority in committees or in individuals.

The centralization or the decentralization of authority.

The use of accumulated experience or the use of research as a measure of accomplishment.

The meeting of conditions as they arise or the seeking to forecast and prepare for them in advance.

By "the subdivision of duties and responsibilities on the basis of function or of personality of executive," I mean that there is a tendency to assign work to individuals because of the circumstance of their availability, their reputation or personal relations to the one making the assignment. However easy and agreeable this method of assignment may be to the chief, it is enormously detrimental to the organization itself. While it goes without saying that the one to whom an assignment is made must be able and have the necessary capacity for the matter in hand, it is in most cases even more important that he should be the person charged with responsibility in such other matters as need to be coordinated with the one in question. This I believe to be the underlying principle of functional organization. The mere making of a chart according to functional subdivisions of the work and the assigning of general responsibilities on this basis, means very little unless the chief is willing to be guided in making special assignments by the relationship of the thing to be assigned to the duties and responsibilities of his various assistants.

By "the lodging of final authority in committees or in individuals," I have in mind the difference between joint and individual responsibility. With the committee form of organization, responsibilities are divided and what is the duty of more than one person is no one's duty. Advisory committees are sometimes helpful in developing various alternative possibilities, but there is always the great danger that they will be used to elude individuality. There is another undesirable factor with reference to committee decisions. Most men will accede and respond to a decision rendered by the person responsible for the decision, but there is an instinctive distaste for accepting impersonal decisions.

A committee is a clumsy thing at best. If it undertook to get a meeting of minds on every question it has to decide, it would be like a jury. It would spend days on each question. It must by the very nature of things be superficial or perish. It is too many-sided, and like the too versatile man, seldom sees anything sufficiently one way or the other to be consistent and forceful. I remember as a boy wondering why so many seemingly stupid men were successful. I know now it was because, although they saw only one thing, they saw it clearly and prosecuted it aggressively. Single-mindedness has made more men than it has ruined. I go so far as to say, saving only in a very few extreme cases, when the president or the general manager comes to taking orders in any real sense of the word, even from his board of directors, it is time for him to resign.

---

[1] Paper presented before the Executives' Club of the Boston Chamber of Commerce, February 20, 1923.

[2] Manager New York office, Day & Zimmermann, Inc., Engineers, Philadelphia.

By "the centralization or the decentralization of authority," I have in mind the question which received so much attention in connection with our Government organizations during the war. Assuming that it is necessary to have a number of plants or branches, the question arises as to the extent to which each should be independent of the other and the extent to which all should be dependent upon the central office.

Thanks to the emphasis put upon this subject during the war, I think one answer to this question is now pretty generally accepted; namely, that so far as possible, methods should be alike in all branches and departments of the same organization. That is, they should use the same terminology, make their budgets, keep their books, and express their results in common terms, very much as the steam railroads make their reports to the Interstate Commerce Commission; on the other hand, in matters of current executive judgment each unit, so far as possible, should be independent of the other and made subject to the central office only in the sense of review after the fact, as distinguished from the necessity for consultation before action. With freedom to act, yet with the restraint which certainty of intelligent review and comparison of results with other departments assures, one can be reasonably sure that the man who does not succeed under these conditions is lacking in the essential qualities necessary to commercial success. In direct proportion to the extent that one man is made subject to the will of another in matters other than those requiring to be coordinated do we destroy the interest and initiative of those we subordinate.

By "the use of accumulated experience or the use of research as a measure of accomplishment," I have in mind the distinction between a time study made on the basis of a study of unit operations under the conditions under which the work is to be performed, as compared with the average of actual results over a period of time under varying conditions. Applying this distinction to what is generally known as the business end of an enterprise, it is the difference between a budget made on the basis of what the expense should be and one made on the basis of what the expense has been in the past.

This distinction is so easily made in words that it is always a surprise to find how few people get its full significance. I was recently going over a proposed budget for a concern that had a very large correspondence department. There was one item of several thousand dollars a month for postage without any explanation. I asked where they got the figure and was told that it was the average of several years' experience. This answer was given me by an unusually intelligent person to whom I had only the day before emphasized the distinction I have just made. In answering every question I asked the tendency was to refer to past records.

What I mean by a budget based upon research in a matter of this kind is a budget based upon the number of letters found by actual count to have been mailed over a period of time under varying conditions of business. On the basis of a budget made in this way, the previous expense of the concern in question was found to be unreasonably large, whereas the decreased expense since the new budget was made shows that the latter is correct. The mere knowledge of the fact that standards and budgets are based on research of the elements of cost as distinguished from past experience is usually sufficient to hold costs in check. I do not mean to be disparaging of human nature in saying this, but rather to emphasize that such is human nature and moralizing upon the fact will not change it.

By "the meeting of conditions as they arise or the seeking to forecast and prepare for them," I mean expediency versus preparedness, and I know of no particular which so definitely characterizes an organization. One company carries a full line of its finished wares on hand, reasoning that the advantage of manufacturing in quantity and in being able to fill orders promptly more than offsets the cost of the additional capital tied up in this way. Another reasons that the advantage of the atmosphere of being behind on orders and the necessity of hurrying to get them out, or some other such reason, justified a hand to mouth procedure. The thing, however, that really settles this and many other equally important matters of policy is the personality and temperament of the chief executive.

I am not at the moment arguing for one plan or the other, but rather that executives should realize how largely their policies are the result of their personality. Also I want to emphasize the variety of alternative types and policies and the necessity for conscious discrimination between them. To the casual observer who happens to be frequently in the office of the same organization, it is sometimes striking to notice how often the same fundamental question is settled differently under different guises.

I have only scratched the surface of a complex subject but I believe I have said enough to support my thesis that consciousness and consistency in these matters is one of the first and most important ways by which an executive may insure his effectiveness.

But coordinate with this and in everything thereafter the biggest and most difficult task is to put aside his prejudices with reference to his own opinions and those of others. He must realize that the wish is often father to the thought, and that man's thinking is largely a reflex action evolved from the primitive instinct of our biological ancestors.

I was very much interested in a recent article on "The Psychological Basis for the Economic Interpretation of History" by W. F. Ogburn of Columbia University. I have already written him to see if I cannot fire his imagination to the writing of a similar article on "A Psychological Basis for Management."

Looking at management as it exists today, we are a highly developed machine with which it is hard to find much fault from a mechanistic standpoint. With time studies and standards, stores, routing, cost and general accounting systems, and statistical and budget controls, it seems almost infallible. Yet how often do we see a concern with all of this fail, where our fathers succeeded without much, if any, of it. Is the fault with the methods, systems and controls? I do not think so. The fault is with the use of them.

Can you imagine a mechanical engineer working without a knowledge of physics? With all of his mechanisms he would be in a pretty plight without a knowledge of the laws of the physical world with which he deals.

Why then should we expect more of the manager, with all of his methods, systems and controls, when he lacks a knowledge of the laws governing the behavior of man with whom he deals.

The point I want to make is that we managers are dependent upon the personal reaction of those we manage regardless of the justification for the reaction. Yet we spend more time in considering the reasonableness of our proposals than the probable reaction to them. We try to apply *reason* as though it were a *law* with reference to humans, much as we would the laws of physics with reference to materials.

To me it is encouraging that there are those in a position to know who believe and are working to such an end; that by the time our boys' boys are ready to prepare for their careers as managers, it will be as natural and as necessary for them to study psychology as it is for the mechanical engineer of today to study physics.

I do not want to be misunderstood in my use of the word psychology. I do not mean the study of the five senses and the instincts which was the basis of most that we learned when we went to school, but something more causal, more dynamic and more practical. Professor McDougal of Harvard describes the new psychology as dealing "with the springs of human action, the impulses and motives that sustain mental and bodily action and regulate conduct." Some of the younger men believe that with time and research they will be able to prove, with reference to cause and effect in human behavior, sufficient to constitute a practical science that can be used as a basis for dealing with man.

Some experiments at John Hopkins University are typical of what is being done in this connection. On the basis of observations and tests of over 200 infants from the moment of birth for varying periods of weeks and months, it has been demonstrated that the newborn infant brings into this world with him two—and only two—primitive, instinctive fears. Suddenly removing a pillow or support from behind the baby will make it wrinkle up its face and cry. It is also afraid of a sudden loud noise, as of two steel bars struck together. All other fears, as of dark, of animals, of lightning, are the result of association and the traditional teachings of nurses—elders. They took infants only a few weeks old, who had never shown fear when white rats, rabbits and guinea pigs were put beside them. But when at the moment of showing the baby a rabbit they made a sharp noise, association of ideas works so powerfully and so rapidly that after only six repetitions of this experience when the rabbit was again presented to the infant without the noise, he cried and was frightened. They then attempted to find means of removing this fear, but the effort was not so successful. They did, however, find that if the infant were first given the support and comfort of some definite pleasure, such as sucking his thumb, he was much less susceptible to any fear stimulus.

You may wonder why I bring all of this in when I am supposed to be talking about types of management. It is to emphasize the necessity for adapting the type of management to the personality and character of the executive, or in other words, his natural tendencies and disposition, and for him in turn to adapt himself as far as possible to the tendencies and disposition of his subordinates. Little can be gained by reasoning about things which, if one is honest with one's self, can easily be seen to be the direct result of hopes or fears on the part of one's self or of those with whom one is dealing.

While the science of psychology as a basis for management has not yet been evolved, and even if it were, it is already too late for us to include it in our education, it fortunately has already been developed to a point of offering many practical suggestions, and it is not too late for us to profit by them through the reading of the best literature on the subject.

Passing then from the different types of organizations and the personalities and characteristics of executives, we come to the alternative methods and devices through which these may be expressed. There are so many of them, and there are so many variations of each, that it is impracticable to give even a list of them in an evening's talk. I have selected from this mass of material two which I believe to be of great importance in the solution of the problems of the chief executive and at the same time to be sufficiently novel to be of special interest.

Mr. Babson, as I understand him, predicts that the margin of profit in industry, regardless of its short swings and in the large, will be constantly downward over the next thirty to forty years. If this be true, and barring seasonal fluctuations and those of the business cycle—and I believe that it is,—not only for forty years but for all time—there is much reason why we should concern ourselves with the methods and devices of business, for they in their sphere are the equivalent to tools and machines in the sphere of production.

The two devices I have selected for discussion are: "The Classification of Costs in Terms of Responsibilities," and "The Making of Standards which are Adjustable to Changing Conditions."

Before beginning this discussion I want, however, to say that the character and extent of organization and methods used by every executive should be in direct proportion to the need for supplementing memory and for coordinating information, and no more. In other words, if we have a one-man organization, that is, a concern which is dominated by one individual, all we need in the way of organization is records of the things that this one individual cannot remember. When the concern grows to the point of two executives, then we need only such organization and methods as may be necessary to augment the memory of these two individuals, plus that necessary to coordinate their activities; and so we go up the line to the point where we have an organization of a considerable number of major executives and an indefinite number of minor executives. In connection with such an organization it is desirable and even necessary for effective work that we should have not only written organization charts but written assignment of duties and a written office manual, to say nothing of the more specific mechanisms necessary to the conduct of the business.

This is not saying that an organization of this size cannot function without these things, for I know organizations without much, if any, of them which are functioning excellently and in which I should hesitate to recommend their introduction, but my hesitancy is entirely because of my knowledge of the temperament and individuality of the chief executive.

If the chief executive is primarily a handler of men, achieves his ends through their joint enterprise, and contents himself with leadership, it would be worse than useless for him to set up rigid rules and procedures which could only serve to defeat the good will and cooperation he had developed on more flexible lines.

On the other hand, if a chief executive is of a highly executive type and depends more on himself than upon others, he will naturally want rigid rules and methods with which to make his will effective.

We come, then, to the first of the two devices I have selected for discussion—"The Classification of Costs in Terms of Responsibilities." Most accounting classifications are in terms of results, and the executive who is dissatisfied with results submitted sometimes has difficulty in analyzing them into causes which he may affect. My suggestion is that we use our organization chart as our accounting classification and that the expense in connection with all activities be charged to the unit of the organization responsible for the cost of the activity.

If the organization chart represents the units of responsibilities upon which the success or failure of the enterprize depends, then obviously it represents the units in which all costs and records should be kept, if the chief executive is to exercise an effective control over the situation. Assigning responsibilities and duties on one basis and keeping records on another, is like trying to check with a bushel basket something bought by the pound. That is what is unconsciously being done, at least to some extent, in every organization wherein the accounting classification was made prior to the organization chart. A great many concerns, without making the organization chart and the accounting classification synonomous with each other, have made such a close coordination as to get very much the same result. I prefer to see them made synonomous.

Most concerns distribute certain overhead expense items direct to the various major departments. In this case these items never appear as such in the operating statement. My idea is that every expenditure should be charged to the organization unit which is responsible for it, and should stop there. The name of the organization unit and the name of the ledger account should be the same, and they should be synonomous for John Smith or Bill Brown or whoever is in responsible charge of the organization unit in question. This would mean that no part of any expenditure for rent, insurance, interest or any other item which the head of the organization unit does not arrange for and in effect pass the bill for, should be prorated to him; and no part of any expenditure for which he is responsible should be prorated to the unit of someone else, that is, so far as the book records or the operating statement which goes to the chief executive are concerned.

After the operating statement, expressed in terms of expenditures for which each organization unit is responsible, has been made, the overhead expense items can readily be distributed over the various departments or commodities, but I would prefer that this be done statistically in the form of a recapitulation of the operating statement and that the book records remain in terms of responsibilities.

I turn now to "The Making of Standards which are Adjustable to Changing Conditions." Much interest has been focused on the making of budgets, especially since the recent period of deflation during which expenses got so out of control that deficits have become almost fashionable.

Most criticism of the use of the budget in industry applies to its inflexibility. In institutions where expenditures are more or less uniform and in businesses where production and distribution are uniform, there is little trouble, but dissatisfaction arises wherever the business is seasonable and averages do not apply.

Costs are usually divided into *direct costs,* meaning those items which are directly related to the cost of a commodity or service, and *indirect costs,* meaning those which are general in character and must be prorated to the various commodities or products. This is the generally accepted subdivision of cost, and it has been very helpful to executives in analyzing their operating problems; but for purposes of budget making, if the budget is to be flexible, it is necessary to make a further analysis into what I have termed *fixed* and *variable* costs.

By *fixed cost* I mean that part of cost which exists irrespective of the volume of business done.

By *variable cost* I mean that part of cost which varies in proportion to the volume of business done.

This subdivision of costs into *fixed* and *variable* is not so much a distinction between such items as rent representing a fixed cost and material representing a variable cost, as it is a division of the various items. For example, a certain part of office salaries is fixed and unavoidable, whereas a certain other portion is variable and should vary with the volume of business done.

If the variable cost varies in amount with the volume of business but is always the same percent of the business done, while the fixed cost stays fixed regardless of the volume of business, then the difference between the per cent of variable cost and 100 per cent (as representing the business done) may be called the "Contribution to Fixed Cost or Profit."

In other words, if the variable cost is 75 per cent or 75c out of each $1.00 of business, there must be 25c out of each $1.00 of business applicable to fixed cost until it is offset, and thereafter to profit; if the fixed cost should be $10,000 a month, it will take a business of four times this amount, or $40,000 a month, to break even, and we shall make or lose 25c out of each $1.00 of business more or less than $40,000 in each month.

When we have all of the items of expense which enter into the conduct of a business divided into that portion of each which is fixed and that portion of each which is variable, and the variable expressed in per cent of volume of business, it will readily be seen that we can then make a budget to meet the changing conditions of each month's business.

This division cannot be made by analysis of the items. It can be made only by the use of a mathematical formula which I gave in a talk on this subject before the annual meeting of the Taylor Society in 1921, and which is published in the *Bulletin of the Taylor Society,* Vol. VII, No. 2, April, 1922. The diagrams and charts accompanying that article help to make it clear.

Let us assume we are making a budget for the clerical force in some one department of an industry. If we set the budget at $1,000 for a month as representing the average expectation over the period of a year, and we find in one month that the actual cost is $700 and in another is $1,000, even though we know we were very dull in the first and very busy in the latter, the budget had almost as well not be made. On the other hand, suppose that instead of making an average budget we should make a budget in terms of that part of the clerical expense which is fixed and that portion of it which is variable, then we should be able to judge both the $700 and the $1,000 expenditure on the basis of the condition under which they were made.

Let us say, for example, that it had been determined that our fixed cost for clerical help was $500 a month and our variable cost one-tenth of one per cent of the volume of business done. Now if in the month in which we had a payroll of $700 we had done $200,000 business, our budget would have been $500 fixed cost, and one-tenth of one per cent of $200,000, or $200, variable cost, or $700 in all. This would mean the actual cost of $700 was justified. On the other hand, let us assume that in the month in which the payroll was $1,000 we did a business of $400,000; the budget would then be $500 fixed cost and one-tenth of one per cent of $400,000, or $400, variable cost, making $900 in all. We would at once know that the head of the department in the rush of increased business had lost his head and put on more help than he needed. Following this idea, it is possible to make a flexible budget for every item, or I should prefer to say, every responsibility; and from these a budget can be made for each month on the basis of the actually existing conditions.

As illustrating the application of these methods to industry, let us imagine a business wherein the product had to be manufactured after it was sold and the selling was concentrated in four brief seasons. I do not think I need say anything as to the difficulties which a business of this character presents.

By means of a budget such as I have described, it is possible, even in a business of this kind, to forecast the expenditures and profits and losses, on the basis of expectations in the matter of monthly sales; and by adjusting these forecasts to the actual sales at the close of each month, to set up a reliable standard for comparison with actual expense.

In such a business there would be months in which the losses would be heavy and others in which the profits would be correspondingly large. Without a measure by means of which one may determine what these losses and profits should be in each month according to the business actually done, the head of such a business is necessarily subject to constant hopes and fears which it is impossible to stay.

Where the actual expenditures are divided according to the individuals responsible for them, and they are accompanied with budget figures in the same subdivisions based upon the same volume of business and conditions under which the actual expenditures were incurred, there is little difficulty for the executive to know wherein his troubles, if at all, lie and who is responsible for them. And when he knows who is responsible, and for what, a sound judgment is possible.

EVEN where the effort has been made to develop the scientific side of management, however, the popular imagination has been caught by that part of it which deals with shop planning and incentive payment, and more than its share of the average manager's serious attention is absorbed by the actual *making* of goods. The fact that such planning and payment to be truly effective must be based on unspectacular standardization of equipment and materials has not been sufficiently stressed, and the fact that no part of the business can function to best advantage until all parts function to good advantage is just beginning to be appreciated. (Farquhar, Factory Storekeeping, p. v.)

WHAT the workmen want from their employers beyond anything else is (continuity of employment at) high wages, and what employers want from their workmen most of all is a low labor cost of manufacture. These two conditions are not diametrically opposed to one another as would appear at first glance. On the contrary, they can be made to go together in all classes of work, without exception, and in the writer's judgment the existence or absence of these two elements forms the best index to either good or bad management. (Taylor, Shop Management, p. 22, as he would have stated it today.)

PREMIUM AND BONUS PLANS[1]

By H. K. Hathaway[2]

THERE have been numerous articles on this subject which present a variety of plans of wage payments and their technical features. Frankly, I don't believe that I can tell you exactly how some of them work, and I shall not attempt to do so. I want to approach it from a slightly different angle.

When I first began to be interested in things of this sort, there were only four generally known systems of wage payment:

1. Day Work
2. Piece Work
3. Taylor's Differential Piece Rate
4. Halsey's Premium

Since that time the number has been vastly increased. Almost every budding young efficiency engineer seems to have been fired with an ambition to have a pay system or bonus system—or some system—known by his name. All of these schemes are modifications or permutations of the essential features of the four mentioned. What I want to do tonight is to bring out and make clear certain fundamental characteristics and to point out the basic principles underlying the various pay systems.

They may be divided, broadly speaking, into two groups. Taylor in presenting his paper at the A. S. M. E. on the differential piece rate system referred to Halsey's premium plan which, at that time, was attracting a great deal of attention as a "drifting system." One class of pay systems may be classed as the "drifting systems," being those systems in which the management either does not assume or consciously or unconsciously evades its responsibility. The other group may be called the "task systems," those in which the management does assume its responsibilities. The second group would include only the two pay systems--Taylor's differential and Gantt's task and bonus—generally used in connection with scientific management. Indeed, they can not and should not be used except under the rather highly standardized conditions and precision of planning and control found only under a well developed application of scientific management. The other forms of wage payment are better adapted to what have been characterized as the unsystematized and systematized stages through which it seems necessary for management to progress before attaining the so-called scientific form.

The "task systems" of payment involve the obligation for carrying out in practice what Taylor referred to as the four principles of scientific management:

1. The development of a science or art in the place of "rule of thumb" in each procedure.
2. The scientific selection and training of the workers.
3. A proper division of responsibility between the management on the one hand, the scientifically selected workmen on the other.
4. The bringing about of what Taylor termed "hearty cooperation between the management and the men."

Under the first group of pay systems (drifting systems) the management does not attempt to know how long it should take to do a given piece of work. They do not attempt to select their workers with regard to their fitness for the work. They assume that a man's a man. Some are good men and some are poor men. The management does not assume any responsibility, or at least very little responsibility, for the conditions governing the performance of work. They merely set a time or a piece rate for each job. The management in the drifting systems "passes the buck" to the workmen. You will find in all of them they expect the workmen to use *his* ingenuity and to effect the improvements. It is a carry-over from the old days of the journeyman craftsman. The journeyman perhaps knew and was expected to know more about his particular trade than anyone else.

If you are going to apply the "task system," the management must know at least as much about the doing of the work as do the workmen, and it ought to know more; certainly more than any *one* workman knows. This knowledge it acquires by analytical studies of the processes involved, of the equipment, materials and all conditions affecting the work. As a result of such studies it brings together and codifies not only the combined best traditional knowledge, but eliminates that which is unsound and adds much of value to that which previously existed. The development of high-speed was one outcome of such studies. Improvement of equipment and the establishment of standards are another result of these studies. This is briefly what is involved in the application of the first principle of scientific management. Without this it is obvious that the management is in no position to say definitely, as a task system requires, how long it should take to do a given piece of work. Without the application of this principle neither the management nor the worker can have any honest confidence in the rates set.

---

[1] A paper presented before the Works Managers Course, Wharton School, University of Pennsylvania, Jan. 18, 1923.

[2] Consulting Engineer, Philadelphia.

Among the "drifting systems" may be classed straight piece work, the Halsey premium system—which, after all, is the basis of all the others—the Rowan system, which is used in England, the Emerson system, and the numerous others that have sprung from them.

The Piece-Work System

Straight Piece Work has a number of disadvantages:

1. It is objectionable on account of its inflexibility. For instance, we have a group of operators doing a certain kind of work. Those operators are all paid the same rate. Some of them may be operators who have been with the concern for a great many years and are efficient operators. Some of them are new. Some are efficient, reliable and loyal. Some are not. They are all earning the same pay. You can't very well under piece work pay one operator one piece rate and another operator another piece rate for the same job. Furthermore it does not readily permit natural and gradual readjustment of wage rates to meet economic changes.

2. You will find, if you have say forty or fifty operators, that possibly four or five of them are at the top earning the top wage. Then taking that as 100 per cent, they dwindle down to 35 or 40 per cent of your best operators' earnings, and your average is probably around 60 to 70 per cent. In other words, your best operators represent the production that you should get, and your average production is around 60 or 70 per cent. The reason for that is that, under straight piece rate, the management ~~does not~~ seem to concern itself with how much or how little any operator turns out. It doesn't assume any responsibility for scientifically or carefully selecting their workers or training their workers, or for the conditions governing the work. If the management concerns itself at all about this it usually ends in a confession of helplessness and self pity. "It's too bad but the workers are what God made them—some good, some bad." This is the easiest way to meet the situation.

3. A given worker at one time may turn out a high rate of production. At another time he may fall off 10 per cent or more. It doesn't worry the worker or the management, because the latter *pays the worker only for what he does*. It follows that this encourages absenteeism and tardiness and letting down on production for any and all reasons. The fallacy that *"we pay only for what they do"* blinds the management to all sorts of inefficiency on the part of everybody from the worker to the general manager. Especially is this true in the matter of keeping workers supplied with an ample supply of work, or in a word, utilization of plant capacity.

4. The fact that under straight piece work it is very difficult to transfer operators from one class of work to another in addition to the foregoing objectionable features, results in the force at all times being larger than it should; and while there is no loss from inefficiency in the matter of direct labor cost there is a constant loss in indirect cost.

Under the type of pay system in which I believe, that condition cannot exist, because, if workers are not kept supplied with work, the management pays him not only for what he does but for his time.

Very soon one finds under a "task system" that it pays to teach the workers to do a variety of things. Straight piece work supplies no spur to the management. You want an incentive for the management fully as much as you need it for the worker, and you want a pay system which will supply an incentive for the worker and an equal or greater incentive for the management.

Halsey's Premium System

Under this scheme as originally conceived you take the time that it previously has taken to do a given job and you make that the premium time. If a job has been taking ten hours to do and you make that the premium time, if the worker reduces that time, the management splits with him, generally on a "fifty-fifty" basis.

Halsey's premium system has one advantage—it guarantees day rate and permits you to compensate in addition to the regular compensation given an operator for length of service or greater worth.

Now let us say that a concern has established the Halsey premium system. You have, we will say, a cylinder to be bored, turned, and drilled. There will be a certain time set for each of these operations based upon records of the time it has been taking to do them. At the time the premium rates were set, our practice was to set that cylinder on a pair of V blocks on the carriage of a lathe, and bore it out. We faced it by clamping a facing head on the boring bar. We planed it by setting it on a planer and we laid it out and drilled it, one hole at a time. Now let us suppose that all of a sudden there becomes an increased demand for that particular cylinder—so much demand that we put in a special boring mill to bore it, which enables us to do the boring in very much less time than did the crude way used before. Next, we put in a multiple spindle drill, which enables us to drill from a jig the whole flock of holes at one time. When we established the time for doing each of these operations, we promised the workmen that we would not cut the rates. Half of any saving that is effected was to be given to them.

Under the new conditions it takes less than one-quarter the time it took when the rate was established. The same condition in greater or lesser degree develops in connection with all the products of the plant. Little by little there have crept in various improvements for which the worker is in no way responsible.

Your competitor is not handicapped as you are by "premium rates" based on primative methods and equipment. He may even on "day work" be turning out the same jobs in less time than your men who may not feel that it is safe to show too great a contrast between the time taken and the "premium time." As a consequence, your costs are higher than your competitor's selling price and you must either lose money or let him have the orders. You find yourself up against a condition which forces you, if you are going to stay in business, to go back on your agreement with the men. And that is exactly what happens. A plant in this town had just that experience. It was forced to cut rates to meet competition. As a consequence there was a strike.

In addition to what I have said, there is another point. You go ahead and install the Halsey premium system—and the same thing holds of the others. You assume that your workmen are going to take each and every opportunity to decrease the time set and earn higher premiums. They may do that, but not generally. As a rule, in every shop working under straight piece work and the premium systems, the workers will set for themselves what they regard as a proper maximum to earn.

I have referred to setting the premium time on a basis of the time that work previously took. I had an illuminating experience with that method about twenty years ago when Halsey's system was receiving much attention, it having just been endorsed and recommended by the National Metal Trades Association. A concern of which I had just become superintendent had been tabulating over a period of two years the time taken for each operation on each piece of their product. I found the wide variation of from less than one hour to twenty hours for planing a connection rod! All I could do was to use my best judgment in deciding what to adopt as the premium time—eliminating those records that seemed unreasonable. I also found later on that certain operations had been performed by competent and conscientious workers—for whom there was little opportunity to reduce their past time—while others had been done by men who were lazy and incompetent —whose past output could easily be doubled.

It is obvious that rates thus established must in a great measure be unfair and not result in improving the management's standing in the minds of the workers.

The "premium time" for new work—for which there are no records—must be arrived at by some sort of estimate—usually in the same way that old-fashioned piece rates are set. They may be high or they may be low—as a rule they will be consistently low in comparison to older rates based on records of past performance. Lack of uniformity in rates under any scheme is objectionable. In piece work shops this is what is known as "good work and bad work"—a great obstacle to efficient management and a source of trouble as anyone who has had experience with it, as many a foreman or superintendent can tell you.

Halsey's premium system has been used in shops where in varying degree the premium time has been based upon studies and standardized conditions. It has even been used in connection with an otherwise really good application of the principles of scientific management, but its use under such conditions has never appealed to me for the following reasons:

1. It seems foolish, when under standardized conditions the studies unquestionably show that a job can and should be done say in ten hours, to tell the worker that twenty hours is allowed and that he will be given half of what he saves if he does it in less.

2. Theoretically at least the management has no

cause to complain if the workman takes anywhere up to twenty hours to do a ten-hour job—it is up to him.

3. There is not a sufficiently clear placing of responsibility on the management for the maintenance of standards upon which the performance of the work in the time the studies show it should be done. If the worker exceeds this time it is too easy to blame the workman, and as in straight piece work the old excuse may be fallen back upon—that some are good workmen and some are poor.

Emerson's Bonus System

A time is set for the job and if the workman does the job in the time set, which is called 100 per cent, he gets a 20 per cent bonus. He can exceed that time up to 60 per cent and he still gets some premium. As the time is decreased his premium or bonus mounts.

A time is set, which is not the right time, since it is assumed the job can be done in less, and is called 100 per cent efficiency. But 100 per cent efficiency, in my mind, is 100 per cent efficiency, and not more or less. The Emerson plan as a rule, as I have seen it applied, has not been based upon standardized conditions, or on such accurate studies as are essential to a "task system."

In this scheme, as in some other offsprings of the Halsey system, there is an attempt to average up the "good work" and "bad work" by lumping the "time allowed" for all jobs done during a pay period and basing the bonus or premium on the total time taken as compared therewith. This practice permits considerable inaccuracy with respect to individual jobs so long as on the average the time is amply high. It may, however, work out to the disadvantage of the worker as often as to his advantage.

Its sliding scale of bonuses permits the same evasion of responsibility on the part of the management as in the case of straight piece work or the Halsey premium system.

Task System

Taylor was the first man to advocate a task system, a system of pay in which the extra earnings depend upon the performance of a definite task under definite and standardized conditions in a definite manner and in a definite prescribed time. If a man does the job in the time set or less, he gets the high rate. If he exceeds that time, he gets the low rate. Earning the high rate also requires that the quality of the work be up to the standard.

The differential piece rate has some of the disadvantages of straight piece work—notably that the same rate applies to all workers doing a given class of work irrespective of other considerations, and that if the cost of living goes down, you can not adjust your rates of pay very easily without cutting your rates. On the other hand, under the task and bonus system you can bring about a gradual downward readjustment of wages, if that is the proper thing to do. You may not want to cut the wages of your old hands, but as you hire new people to take the place of men who leave, you can hire them at prevailing rates. This cannot be done in piece rate work.

Gantt Task and Bonus System

This scheme is to my mind infinitely superior—once a plant has attained the scientific management stage in its progress—to any of the other schemes we have discussed. Except that the basis is a price per hour instead of a price per piece and that the penalty for failure to accomplish a job in the time set may be less severe, it is essentially the same as Taylor's differential piece rate scheme.

Under Taylor's scheme say the task time is 10 hours and the "high rate" is $10—if the job is done in 10 hours or less—and that the "low rate" is $7.50. Now suppose, taking an unlikely extreme case, a man for some reason takes 20 hours to do the job, he will receive only $7.50. Under Gantt's scheme he would get his hourly rate of pay for the full time taken—say $.75 per hour—making his pay for the 20 hours spent on the job $15 instead of $7.50 as under the original Taylor scheme.

The arguments set forth in the literature discussing wage rates for and against task and bonus are not all of them quite up-to-date. Some of them do not hold good.

This scheme was developed while Gantt was working with Taylor at the Bethlehem Steel Works, and at that time and for a number of years afterward they felt that its greatest advantage lay in the less severe penalty for failure; that it was preferable therefore to the differential rate, especially during the earlier stages of the development and installation of a system of scientific management, before conditions are fully standardized and the planning and control system still imperfect.

To some extent it was regarded as an intermediate step toward differential piece work. In my own experience covering about eighteen years I have not found that the less severe penalty feature cut any ice in actual practice. It might appeal to the worker and the manager—giving the former a greater feeling of security—but the fact is that if the work which properly must precede any form of task system has been well done, and if the task system is properly installed, the workers will and should accomplish their tasks in the time set right from the start. So far as that is concerned either system of pay might be established. Another point is that in actual practice, if the system is properly installed and administered, it is an exception for a worker to fail to accomplish a task on time—excepting when the cause of failure is obviously beyond his control. Every such case is investigated and if the circumstances warrant, extra time is allowed for the specific job only—as for instance in the machine shop practice if a casting has excess stock requiring an extra cut, or material is harder than it should be, necessitating less feed or speed than that specified. Where such extra allowances are made, steps are taken to prevent the trouble recurring in the future. They should of course be of infrequent occurrence. Usually they are reported, investigated and adjusted while the job is in progress. It has been my experience that in the great majority of cases, failure to accomplish a task is due to some shortcoming of the management rather than of the worker.

Under the task and bonus system a sufficient number of hours work must be kept ahead of the worker, the loss of bonus in case each job is not furnished on time being large enough to overcome any inclination to stretch a job out when work may appear to be scarce, or to overcome the tendency to soldier, which, as I have stated, arises at times under straight piece work. The worker may be depended upon to turn out his jobs on time and to put up a kick if he is not kept supplied with work or if standard conditions are not maintained. As it is customary to pay the functional foremen in the shops a bonus based upon the percentage of jobs finished on time by their men, they may be counted upon to back up their men in holding the management up to its job. In this, to my mind, lies one of the greatest merits of the task systems—the workers push the management more than the management pushes them.

Failure to provide enough work results in a just penalty upon the management under Gantt's scheme, as the workers must be paid at their "day rate" for any "waiting time," which is charged to that branch of the management responsible and cannot be ignored or hidden by tacit understanding, as is the case under piece work and in varying degree under a premium system.

Task and bonus in connection with suitable mechanisms—route sheets, operation orders, bulletin boards, etc.—for planning and control of plant operation, leads to the maintenance of a force properly adjusted to the volume of work, instead of one large enough to handle the peak load in all departments or operations. It results in looking further ahead; in more uniform earnings for the employers and in the long run in smaller labor turn-over. Employees are taught to do more than a single operation so that if one class of work drops off and another builds up they can be shifted to meet such fluctuations. Contrary to the opinion held by the uninformed, there is less of objectionable, intensive specialization under scientific management than under "systematized" or "unsystematized" management. Versatility on the part of a worker is an asset, and it is an advantage to be able to pay a higher rate in proportion as a worker is able to do any work to which he may be assigned. This is possible under Gantt's scheme.

Gantt's original plan was to set a task time upon which the "bonus" was based. The rate of bonus varied, depending upon the nature of the work, from a minimum of 20 per cent to as high as 100 per cent of the task time. For work such as general machine work 35 per cent has proved popular.

Classes of work making greater demands on skill, exertion or responsibility, or of a disagreeable nature, would call for a higher rate of bonus. On relatively simple repetitive work 25 per cent is satisfactory, although if the gains in production permit, as they usually do, it is better to pay 30 or 35 per cent. Anything less than 20 per cent is not sufficiently attractive to be effective. How high the bonus rate may be placed depends in some measure upon the savings in direct wage cost resulting from the change to "task and bonus."

For illustration of the working of this scheme, let us suppose that 10 hours is the task time for a job, 35 per cent, or 3½ hours, the "bonus" to be paid if the job is done in 10 hours or less, and the workers "day rate" to be \$.50 per hour. Then if the worker finishes the job in 10 hours he would receive 13½ hours pay @ 50c = \$6.75 or \$.675 per hour. If he does it in less than 10 hours he is paid for the time taken plus the bonus time, 3½ hours. If, for instance, he takes only 8 hours, his pay would be 8 plus 3½ = 11½ × \$.50 = \$5.75 or \$.72 per hour. His bonus rate based upon the time taken would in this case actually be 43.7 instead of 35 per cent. His total pay for the job would have increased only 6-2/3 per cent while he saved 20 per cent of the time allowed.

Later Gantt changed this—unwisely I believe—so that if in any case the job were done in the task time or less, the worker would be paid for the time allowed plus the bonus time, making the plan identical with Taylor's differential rate in that respect. Thus if the job were done in 8 hours the worker would be paid 13½ × 50 or $6.75 instead of $5.75 as in the original scheme. This places a premium on beating the time set rather than meeting it, and in that, it has been my experience, a grave danger lies. It is a siren song to which the inexperienced or the greedy manager is all too willing to listen. Of course in taking as an illustration the accomplishment of a 10-hour job in 8 hours, I have gone to an extreme. Providing the time is accurately set, that there is no error in writing the instruction card defining the method, that the method is followed in doing the work, and that all of the conditions as to quality are complied with, there should be no such possibility, and it is unreasonable to expect the worker to do a job in less than the time set. Any such expectation indicates a lack of faith in the management's own ability to do its work properly, and will ultimately lead to disaster. Under "task and bonus" or "differential piece work" as applied in connection with scientific management, it is just as dangerous and undesirable to have work done in much less than the task time as to have it take more than the task time.

Where workers consistently beat the time it will invariably be found that it is at the sacrifice of one or all of the following; quality of work, tools and equipment, or the worker's own welfare. Here lies the objection to the temptation of Gantt's modification of his scheme, and I assure you that it is a very real one, although most people have to burn their fingers before realizing it.

Gantt's scheme was to set the time for the job. If the job was done in the time set (say 10 hours) your day rate is $.75 per hour. Therefore, you will receive 10 hours pay plus a bonus of 35 per cent. If, however, you exceed the time, you will receive merely your day rate, or 11 hours' pay but no bonus. If the work is done in 8 hours, you get pay for the actual time plus the fixed bonus of 35 per cent, or pay for 11½ hours.

In one shop there was a perfect mania for beating time. The quality of the work turned out went down steadily, machinery and tools were put out of commission, and the management lost more than it gained.

Under the task and bonus system when properly applied, you will find that, taking the shop as a whole, 95 per cent of all the work is done in the time set.

In conclusion I want to emphasize the importance of something which is little understood and to the neglect of which may be traced the failure or troubles resulting from any incentive scheme of wage payment; that is, failure to back up the task time with a clear and detailed definition of the method, the machine, the tools and the conditions upon which the set time is based. To say that the time allowed for boring a cylinder is 10 hours without specifying these things is comparable to saying that it should take a man one hour to travel four miles without specifying whether he is to go by ox cart or automobile, whether carrying a heavy load or nothing. It is like telling a contractor to build you a house for $20,000 without saying what kind of a house is wanted.

For every job there should be a detailed instruction card giving the time for each elementary sub-division of the job and a complete list of the tools required. Examples of these may be found in my paper on "Standards" with which I believe you are familiar.[1] These must be made accessible to the worker for each job he does—not filed away in the office or planning department—and the management must see that the method upon which the time is based is followed. An important duty of that functional foreman known as the instructor or methods supervisor (originally called by Taylor the speed-boss because of his jurisdiction over cutting speeds), who is in the shop the representative of the time and methods section of the planning department, is to see that the prescribed methods are adhered to and that proper adjustments are made as exceptions arise.

Just as the standard method and equipment involved in the performance of an operation must be clearly specified, so also must the quality of workmanship be definitely and clearly indicated on drawings, specifications or their equivalent. Inspection for quality under any incentive system, vitally important, is under a task system imperative. It must be borne in mind that the bonus is paid for the work, not only being performed in the time set and according to the prescribed method, but also for its being up to the standard of quality specified; which of course, governs largely the method and time. Doing work in less than the task time is usually an indication of a let down in quality.

If it is clearly understood that the time allowed for a job is for doing it in accordance with the specifications, and the method is covered by detailed instruction cards and tool lists, the time may be revised without any objection or resentment from the worker to take care of improvement in method, equipment or material, changes in design, and so on, a new instruction card taking the place of the old one in all such cases. Suppose for instance we have a casting in which several holes are to be drilled and reamed. Later on it is found that one of these holes may be cored in the casting. All that would be necessary would be to cross off on the card the items covering drilling of this hole and the elementary time for same, deducting it from the total time for the job.

---

[1] *Bulletin of the Taylor Society*, Vol. V, No. 1, Feb., 1920.

What ordinarily happens, in the absence of detailed instruction cards showing what the time for the job or the rate includes, is that changes of this sort and improvements are made in the work without changing the rate or time allowed. Usually such changes taken individually are quite unimportant and affect the total time very little, but they come about insidiously and steadily and in the aggregate, over a period of several years, amount to a great deal. They are perhaps the greatest cause for "rate cutting" and other apparent breaches of faith; and while they may be justified and inevitable from a business and economic standpoint, the worker cannot be blamed for feeling that they are unfair.

In the lack of standard conditions, clearly defined methods and quality, and of accurate knowledge as to the time work should take, will be found, I believe, the root of organized labor's opposition to any pay system other than straight day work.

Gantt's task and bonus system in its original form, when based upon a properly laid foundation and properly administered as a part of a complete system of scientific management is in my judgment not only the best from the standpoint of accomplishment in the matter of high production and low cost, but is tremendously valuable as a preventive of those misunderstandings and that mistrust that are at the bottom of most labor troubles.

GREAT managers are primarily concerned not with today, but with tomorrow. This is true because they have taken advantage of the possibility of standardizing those features of their work which lend themselves to standardization so that they are left free to give their personal attention where it is really most needed—to matters which cannot be systematically controlled. The administration of any industrial enterprise may be broadly divided into the management of *men*, and the management of *things* such as plant, equipment, and materials. The former constitutes the art in management, while the latter is susceptible to a more scientific regulation. If the administration of industrials is to become less of an art and more of a science, a sharp division must be made between those matters which from their very nature must remain largely in the realm of art—the functions of dealing with human beings and with intangible questions of policy—and those which may be controlled through predetermined and systematic procedure. (Farquhar, Factory Storekeeping, p. v.)

THE status of the foreman and the character of his duties and responsibiilties has changed to a marked degree in most industrial establishments. Many of his former duties have been taken away and placed in the hands of specialists. He is no longer expected to hire his own workers, care for his equipment, produce and inspect work, determine sequence of orders, figure costs, etc. These and other important functions have been taken over by others better qualified by virtue of their education and training and because of the opportunity to concentrate on their individual problems. The foreman, however, remains the active executive head, responsible for the operation and the coordination of the work of his department with that of other departments and with the staff organization. He is relieved of many of his former duties, but is charged with even greater responsibilities. An examination of the duties of a foreman finds them a complication of technical, personnel, and administrative functions. (Porosky, Practical Factory Administration, p. 136.)

TIME STUDY

By Dwight V. Merrick[1]

THE idea of time study is not new. Records show that a Frenchman sometime in the seventeenth century made time studies with a watch of that period, and no doubt, if the record of the Babylonian period were sufficiently complete, we might find reference to methods of measuring productive effort in building the tower of Babel.

It is certain that time study was never used to any extent in securing economies in productive effort until the time of Frederick W. Taylor, who conceived elementary time study and arrived at the time with the aid of a stop watch. Therefore time study dates back to 1881, when Mr. Taylor was foreman of the machine shop at the Midvale Steel Company, Philadelphia. In attempting to determine the proper time to be allowed for any job he recognized that, rather than to search through records of previous performance, it would be more accurate to take each element of the various kinds of work with a stop watch, find the reasonably quickest time in which the job could be done by summing up the total time of its component operations, and add a reasonable percentage of allowance for delays and fatigue. After experimenting with it for two years, he became convinced that this was the proper method of determination of standard times.

Mr. Taylor used time studies for fourteen years before he called it to the attention of manufacturers. In 1895 he presented before a Detroit meeting of the American Society of Mechanical Engineers a paper on time study and rate setting entitled "A Peace Rate System." His audience was not at all prepared for his ideas and methods, and in consequence the discussion following the reading of this paper centered entirely around the differential piece-rate system (which he was also developing) rather than around his methods of determining the time allowance for work by means of time studies. He tried to lead the discussion toward time study, but with little success. In 1903 Mr. Taylor again presented a paper before the A. S. M. E. entitled "Shop Management," which afterwards came out in book form. This book contained numerous references to time study and was virtually an appeal to manufacturers to give time study the attention that it merited. Since then the idea has spread rapidly.

At first many mistakes were made. For example, time studies were started without due consideration being given to standardization of methods and equipment, or to assuring a steady flow of material to the worker. Also, it was at first thought that time studies should be taken without the knowledge of the worker. Stop watches were concealed, sometimes in cases made to look like a book and sometimes in the observer's pocket, in which cases the time study man would have to go behind some object of concealment, in order to make a record of his observations. In another case, the observer sat in a glass cage near the worker and telephoned his readings to a man in the office. These methods were promptly discarded as unsatisfactory because, first, a continuous run cannot be obtained secretly, and second, they are underhanded and absolutely unnecessary when it is considered that without the cooperation of the worker time studies mean little to anyone.

After working at the machinist's trade for seven years, I started with Mr. Taylor in 1898 at the Bethlehem Steel Company on experimental work in developing high speed tools, the steel for which he had discovered. This association with Mr. Taylor led to time-study work on my part, started in 1905 at the Link Belt Company, Philadelphia. But it is of some of my later experiences I have been asked to speak.

Watertown Arsenal is a U. S. arsenal for making gun carriages, field pieces, projectiles, etc., and employed in 1911 about 700 persons. While the management is entirely in the hands of Army officers, the employees are civilians and consist of draftsmen, clerks, mechanics and laborers. We did time-study work there for two years, starting in May 1911 and ending May 1913. The development of time study covered these two years and resulted in an increase in the earnings of mechanics and laborers of about 30 per cent with about 100 per cent increase in production.

---

[1] Consulting Engineer, New York.

From the first there were practically no objections to time study methods on the part of the men in the plant, although most of them were union men. They took to time study as a duck takes to water. At that time, in 1911, high-priced mechanics were paid about $3.70 a day. After the development of time study, their earnings ranged from $.90 to $1.25 a day more than before, depending upon the class of work performed. Therefore the union men in the arsenal were making from $.90 to $1.25 a day more than those outside. I was told by some of the men that they were buying new homes, and that the extra earnings helped considerably in paying off the mortgages.

However, in the fall of 1912 the leaders of the unions at Washington succeeded, in many cases, in having "riders" prohibiting time study or rate setting attached to appropriations made by the Congress for the purpose of building certain gun equipment. Therefore there were many instances of work going through the shops on day work, until finally about July, 1913, nearly all appropriations had this prohibitive clause attached. At the same time a bill was passed by the Congress prohibiting time study and rate setting in all government plants, much to the regret of a great many of the mechanics.

By the spring of 1914 all of the piece rated work had been done away with, that is, the appropriations covering all the work done carried the prohibitive clauses mentioned above. It was certainly a dead place. An interesting incident occurred while there; one of the men who had been vice-president of a union wanted to leave and take employment with me in order to learn time study work and rate setting.

The men, without the incentive of piece work based on time study, had got back to the old ways and production had decreased to its original rate, an operation taking about twice as long as it had taken under time study standards. If these methods had been retained and continued through the war, it would have resulted in about 100 per cent greater production at a cost of about 30 per cent more than the prevailing day rates.

This is in a few words illustrative of the history of time study efforts at the Watertown Arsenal.

The H. H. Franklin Manufacturing Company produces Franklin automobiles. In 1916 time study had been developed in the plant to a point where all rates were on a time basis with all branches of the work going smoothly. The call for men for war service practically glutted the Time Study Department. The scarcity of men made it impossible immediately to build the department up again, with the result that during the war rate setting was done in a make-shift way. Since 1920, however, time study and rate setting have been put back on an efficient basis.

The Winchester Repeating Arms Company manufactures rifles, shot-guns, cartridges and all kinds of sporting goods and during the war employed about 21,000 men. We had fifty-five time study men in the plant taking observations and setting rates and controlling about 150,000 different rates, all of which had been determined by time study and called for a standard production per hour. If in the performance of a job the production did not come up to standard, it was investigated, and, in case the standard proved to be an unfair production figure, it was corrected at once by new studies. On the other hand, if the operator was found to be at fault, he was instructed as to the proper method of performance. When the production figure is equaled or bettered, there is never any difficulty about earnings. The Winchester Company has proceeded further along time study lines than any other company of which I have knowledge.

The Bethlehem Ship Building Company employed about 90,000 men during the war. The work contracted for by this plant was on a cost-plus basis. If all of the ship-building rates had been based on time study with a definite production time for each rate, the building of our ships would not have cost the government what it did. Instead, rates were increased without regard to the time it took to perform the work. In many instances a man could earn as high as $25.00 on piece work in four or five hours without half trying. Nevertheless, orders would come out of Washington to raise the wage scale, and up these rates would go.

Time-study standardization was begun by the company in 1919, after the cost-plus jobs had about run out and rates were coming down. Time study and rate setting were introduced principally in their shipbuilding machine shop in San Francisco. In eight months time about 50 per cent of the man-hours of this shop were on time study rates, the men were earning about 30 per cent more, and production had been increased by 50 per cent. The importance of establishing a production time for every operation was impressed upon everyone. There were times when it was thought that the standard production time was exacting, but in all cases in question an investigation was made and a correction sent through if found in error in either way. All of which resulted in a general good feeling.

Any piece of work entails three fundamental considerations; first, what implements are to be used; second, how it is to be done; and third, the length of time required for its performance. The time required is the all-important consideration, for both means and method are significant chiefly as they affect the time taken. To set a rate at which work should be performed necessitates a preliminary standardization of both the implements to be employed and the method to be followed. The best results are obtained only when these steps have been taken.

An investigation to increase output calls for time study, for time primarily is concerned; therefore time study has for its object: first, the determination of possible improvements in the equipment and in surrounding conditions for producing a given piece of work; second, the determination of possible improvement in the method of actually performing the work; third, the determination of a unit time in which a given piece of work should be finished. Properly speaking the main object of time study is to determine the time for the task; the first two enumerated objects being rather of the nature of analysis and simplification of the motions preparatory to time study—in reality, motion study.

Time study is essentially constructive in its function, for its ultimate object is to arrive at a fair and equitable rate at which work should be done, and this is reached only after each act, incidental in any way to the completion of the operation, has been carefully analyzed and made as convenient and easy as possible for the operator, and all unnecessary motions are eliminated. A detail analysis of all the elements that enter into the completion of the task is made, and the most effective method of operation determined in advance. The fundamental principle underlying time study is that the greatest material gain to the employer is possible only when the employee gains correspondingly and the responsibility for gain is divided equitably between the management and the workers.

No time study should be taken without first thoroughly acquainting those who are in any way connected with the work that it is to be studied, and with the objects of time study and the benefits derived therefrom; and the confidence and full consent of the workmen should be secured.

In taking a time study, there should be made: first, a careful survey of the work and all of the influencing conditions; second, an analytical breaking down of the task into simple elements; third, an observation and record of the time taken in performing each of the elementary operations; and fourth, an analytical study of the recorded unit times. To make use of the data collected for determining a rate at which work should be performed, a fair standard is determined for each one of the elementary operations, due and fair consideration being given to the character of the work and the demands upon the operator. Finally, there is prepared from the time study analysis an instruction card that shows the elementary motions, in the proper sequence, and the standard time for each, there being included an allowance for fatigue and other unavoidable delays. This total constitutes the time in which the work can be performed by an efficient worker.

THERE are many reasons why it is imperative that these problems of human organization within our industries should be solved. I will mention three outstanding ones:

Firstly, productivity depends not only on good engineering, good mechanical devices and good financing, but also on effective personnel administration. A machine can be bought but we must get cooperation from our employees.

Secondly, there is the matter of creating sound human values. If in our factories the handling of human problems is ignored we cannot have sound human values in the community generally, and,

Thirdly, the best melting pot for our social classes is in manufacturing establishments. It is not only a matter of creating a proper understanding between the manual laborers and the monied classes, but also of a proper understanding between manual laborers and the intellectual and professional classes. It is most important that the rank and file appreciate the value of brains in our social structures. Unless executives sell themselves to the rank and file in the plant and factory I do not know how this appreciation can take place. (Sam A. Lewisohn in *American Management Review,* Vol. xii, No. 1, p. 9.)

LABOR CLASSIFICATION AND PAY-ROLL ANALYSIS[1]

By Carleton F. Brown[2]

THE subject which I am to discuss to-night has long been a matter of controversy. Opinions have been almost as numerous as those who held them. We ourselves have in the past been possessed of not one but many at various times.

In presenting our method of solving the problem—a method which we have tested, tried and found satisfactory—I desire to have you bear in mind the following points:

First; My purpose is to classify labor into its primary activities and is not so much concerned with the manner in which it is ultimately charged or distributed. For example, two men may be placed in the same classification, but the product of their efforts may, for purposes of cost distribution, fall under different headings.

Second; The labor or pay roll discussed herein pertains solely to the factory. Selling and general administrative expenses are not included.

Third; Labor as used herein is to be accepted in its broadest sense and to include every individual normal to manufacturing operations from the Works Manager or Superintendent down. This interpretation is equally true of the use of the words "Pay Roll." Methods of pay, whether by the hour, day, week or month, are ignored.

In any manufacturing enterprise labor has been considered, as a general thing, the most important element, although it has not as a rule been given such a broad definition as that above. Rather the tendency has been to limit it to those who work with their hands in the manufacture of the product or perhaps in some cases engaged in other supplemental activities. Another broad way of looking at it has been to consider those who are paid an hourly wage as labor, and those who work by the week or the month as something else.

In broadening the definition of the term labor, I do so with the specific object of bringing into the picture of our plant activities the entire force of workers, whether their efforts be physical, mental or clerical, in order that the inter-relation between such activities may be properly presented.

Now it has been considered that the worker, who with his hands produced or aided in the production of the product which was intended for sale, was the one factor indispensable to the enterprise. The work of all others was in a sense auxiliary or supplemental thereto. This type of worker was called productive because he "produced" the goods which were sold.

The producer, however, had to have help; some one was needed to order material for him; others were needed to look after this material when it was received; and still others were required to direct and supervise his efforts. These were called "non-producers" in contra distinction to the "producers."

It then happened that as a manufacturing business grew, it was found that other enterprises should be engaged in because it was either profitable or convenient to do so. In this type of activity, product was not intended for sale but was to be utilized by the enterprise itself. This developed a third class of workers, many of whom engaged themselves in productive effort. Such productive effort, however, was distinct from that of the first class in that it was not directly applied to the product but to articles of supplementary manufacture.

And yet again, other workers were required—men necessary to the proper conduct of the business, not as clerks or supervisors but as skilled physical labor, such as millwrights or carpenters.

As a result of these varied activities a confusion naturally arose as to who were producers and who were not producers, and there being no practical agreement on the question, various manufacturers went their own ways and not only did their ideas differ from the ideas of other manufacturers, thereby making comparisons impossible, but their own ideas changed from time to time, thereby rendering it difficult to make comparisons of labor conditions with previous years within their own organizations.

---

[1] Paper presented at a meeting of the Central New York Section of the Taylor Society, Syracuse, Jan. 12, 1923.

[2] Treasurer and General Manager, Corona Typewriter Co., Inc., Groton, N. Y.

Latterly, in part due to the development of modern cost accounting and in part due to the freer exchange of facts and ideas as between industries or between members of any given industry, there has arisen a deeper realization of the necessity for more accurately determining basic facts and more particularly the necessity for a correct and well defined terminology. Of what use is the standardization of any cost keeping system or any set of basic facts for the members of an industry, as has been recently attempted in a number of cases, unless the terms used are not merely identical in form but also in meaning. A loosely worded, incorrectly drawn definition of the meaning of a word covering a particular group or classification of facts may and undoubtedly will cause individual interpretations so widely at variance as to render any comparisons worse than useless. In the main there is a fairly extended conception of the meaning of the principal items in the terminology of modern accounting and cost finding, although there is still lacking an agreement in some cases as to the word concerning which the definition is made. For instance, "Overhead," "Burden," "Indirect Expense" and "Manufacturing Expense" are variously used to indicate the same thing. There have been many arguments advanced against some, if not all of these terms. I do not believe, however, that that is a particularly important matter. The main thing is to have it understood that when you use "Burden" and I use "Overhead," we are both speaking of the same thing, and if we compare figures, our comparisons are based upon the same conclusion of facts handled in an identical manner. In other words, it is the definition and the application of the definition which counts and not the particular word which is being defined, although it is naturally true that it is better to have but one word to cover a set of facts and to select that word as one which is the best suited practically, without too much regard for its etymology.

Cost experts have, as a rule, identified the term "productive" with direct labor and "non-productive" with indirect labor, preferring in the majority of cases the use of the words "direct" and "indirect." By so doing they have simplified for themselves to a certain extent the problem of cost distribution, since they have arbitrarily determined that direct labor is that labor which may be directly allocated to a particular operation, process, or production order, and indirect labor that labor which cannot be so allocated. But even with these definitions we find a lack of definiteness which is apt to be puzzling. For example, Franklin says (*Cost Reports for Executives*):

> For cost purposes, labor divides itself into two parts: direct labor, or that which can be shown to have a direct relation to a particular article of production, and indirect labor, that which is general to the whole production. * * * * It may be somewhat difficult in certain classes of work to get the time of operatives exactly apportioned to the different articles of manufacture, but it is not difficult to divide all labor, weekly, between direct and indirect, and to divide all the direct labor over the total production.

Also Kester (*Accounting, Theory and Practice*, Volume II, Page 53):

> DIRECT AND INDIRECT LABOR. * * * * In factory accounting, labor is divided into two classes, direct and indirect. These are sometimes called productive and non-productive, terms doubtless carried over from the old economics which looked upon some labor as productive and some non-productive —necessary, it is true, but rather of the nature of a necessary evil. That is, it is the labor of the workmen who apply themselves directly to the manufactured product as distinguished from the labor of those employees who plan, lay out and supervise the work of others. Direct labor can be definitely allocated to specific product or jobs, because it is applied directly to them. Indirect labor cannot usually be allocated to a definite product because it is applied to all the product, not being employed long enough or definitely enough on any specific product to justify keeping track of the time and charging it to specific product. Direct labor is a prime cost; indirect a factory expense.

Bentley says (*The Science of Accounts*, Page 225) that labor may be classified as—

> (a) Productive Labor.
>
> Labor which is so applied that it can be charged directly to a particular job or process, as the case may be, is termed "Productive Labor." It is also known as "Direct Labor," to distinguish it from indirect or non-productive labor. It forms the second element of manufacturing cost.
>
> (b) Non-Productive.
>
> This term refers particularly to the work of persons employed in the production department whose services are of such a general nature that they cannot be identified with any particular job or process, as the case may be. A productive laborer may at times render non-productive services; e. g., if he temporarily acted as a foreman, or if he devoted time to cleaning a machine, or if he performed any work that could not be charged to a specific job or process.

That cost accountants limit direct or productive labor to that labor which can be charged to the product, would at first seem to be indicated by C. Bertrand Thompson (*How to Find Factory Costs*, Page 24), who says:

> (Indirect Expense) comprises all expenditure for labor and material which does not enter directly into, nor is sold with the product.

Such a definition seems specific enough, yet we find him saying on page 51:

> Expensive tools * * * * do add something to the value of the plant, although * * * * they must be heavily depreciated. This being the case, it is important that the full value of tools, patterns and models be ascertained. To do this it is necessary that they be fully charged with all items of indirect as well as direct expense involved in making them, just as though they were part of the product to be sold. This is a clear case where indirect on indirect is properly chargeable.

It is apparent that with definitions such as those I have instanced we cannot be altogether sure that even cost accountants are of one mind in the matter of direct or productive labor. Do they all make exceptions in cases such as that quoted from Thompson, and if so, how far do these exceptions extend? Is any increase in asset value in plant and equipment, where the time is directly chargeable, to be treated as direct or productive, or are there such occasions when the exception does not apply and the labor should be treated as indirect or non-productive?

From the cost accountant's standpoint, this may not appear of particular moment, since such labor is absorbed in the asset value of the tool or other assets, but from the standpoint of the manufacturer this labor definition may be of considerable moment.

The real difficulty at present with the term "productive" lies in the fact that, being used synonomously with "direct," it receives the limitations of meaning which the cost accountant has found it necessary to impose upon the latter word to enable him to properly handle his cost distribution. Undoubtedly he realizes that the meanings are not fundamentally the same, and therefore he seeks the elimination of the older word to avoid confusion, and from his standpoint such a result may be desirable.

In the process of such elimination, we have recently witnessed a still further step.

Denham ("Cost Finding," *Industrial Management*, June, 1922, Page 377), says:

> One of the unfortunate outgrowths of the uncertain practices, and resultant ambiguous terminology, of traditional cost accounting is the impression, current in the minds of most manufacturers, that all expenditures for clerical effort are "non-productive."
>
> Contrary to the common impression, the prime object of engaging in the business of operating a factory is not to make product, but is to make profits. The making of product is the means and not the end.
>
> It follows that any effort that yields or increases profits is productive, whether that effort is expended at a bench, a machine, or at a desk.
>
> The real test of productivity is in the answer to the question: "Does the effort yield a return in excess of the expense incurred?" If the cost of the effort equals the value of the result, the effort is unprofitable, therefore non-productive. If the cost exceeds the value of the result it creates a loss.

In our own *Bulletin of the Taylor Society* there appeared in the October, 1922 issue an article entitled "Producers and Non-Producers." This article resulted from the inquiry of a manufacturer seeking light on the meaning of the two terms. Basically the article supports and amplifies the theory expounded by Mr. Denham above quoted.

If I may apply the test of productiveness on the basis of profits to an individual or to a department, I may also apply it to a complete organization, and if I so apply it, I find that a given organization in one year was productive because it made $1 of profits, and I find that in the next year the same organization with the same amount of sales is non-productive because it lost $1. It seems to me that such a theory will serve no purpose other than to drive out of industrial terminology the words "productive" and "non-productive." Certainly I cannot conceive of the use of the term "non-productive" if these definitions are to be accepted. Of what practical value would be such use? If we, therefore, admit the elimination of the term "non-productive," we automatically eliminate the necessity for the term "productive."

If I produce something which I cannot sell, it may be argued that I am a non-producer because I have added nothing of practical utility to the benefit of mankind. If, on the other hand, the article which I produce is of practical utility and is purchased by the public, it seems to me that I am a producer whether or not at the end of the year my profit and loss statement shows in red or in black.

As has been indicated, the terms "productive" and "non-productive" have for many years had a certain meaning in industry, the former referring generally to physical labor and particularly to that labor which directly applies itself to the manufacture of the product, and the latter to foremen, clerks, etc. While it is true that there have been many differences of thought as to the true meaning of the words, nevertheless there has been a general conception of such meaning, and at no time until of late has the question of profits been considered as a part of such a general conception. The new theory, however, would appear to make profitableness of operation or effort of any kind the true test of production or non-production.

Now, the average manufacturer is concerned with a number of things in respect to his business which are not essentially functions of cost finding and one of these is a picture of his pay roll. He may not be satisfied with having his labor hidden in cost reports in combination with other items of costs. He may desire to know how many clerks he has, how many hours they have worked, how much they have received; he may desire to know how many workers he has who have applied themselves directly to the manufacture of the product which he is marketing, or the number of workers, who, while not applying themselves directly to the product, are none the less producing articles which, were these workers not on his pay roll, he would otherwise have to purchase outside; he may also wish to know various ratios and percentages as between all these groups.

A Board of Directors, seized with a spirit of economy, may wish to know whether or not the non-producers, the indirect workers, may not be reduced. Imagine trying to satisfy them by saying "We have no non-producers in our plant." With a pay roll analysis properly prepared, it is possible to present to the Board of Directors a picture of the relative pay roll expenditures, and not only for the current month or the current period but to make comparisons with other periods. It is also possible for a manager, after having effected economies in overhead, to present a picture of those economies in the same way through pay roll analysis.

The State of New York collects and tabulates certain data with respect to the labor situation and average earnings of workers in the state. These figures are presumably intended to be of benefit to economists and to industries in general, but when it is impossible for the state to define accurately the distinction between office and factory workers, leaving the matter largely to the individual interpretation of the manufacturer, how reliable may we consider the statistics subsequently issued? Proper and easily understood rules for classifying would permit of additional data being collected by the state with the resulting advantage that comparisons of considerable value could readily be made by manufacturers when the results were tabulated.

That cost experts, in some cases at least, realize the necessity for reports covering pay-roll information of various kinds is evidenced by a very comprehensive article on "Cost Accounting to Aid Production" by G. Charter Harrison, appearing in *Industrial Management* in 1918. It emphasizes the necessity for a summarized pay roll report showing, among other things, such items as—

Number of employees on roll.
Number of employees absent or working short hours, and total hours so lost.
Actual hours worked by operators.
Pay roll of operators.
Average rate per hour of operators.
Hours worked other than by operators.
Pay roll of employees other than operators.
Average rate per hour of such employees.
Total hours worked by all employees.
Average rate per hour earned by all employees.

You and I, each striving independently to prepare for ourselves reports of such a nature, might and probably would under absolutely identical conditions arrive at varying results because of the individual interpretations which we might put upon the classification of our employees.

If then we are to eliminate the terms "producer" and "non-producer," or give them some such interpretation as that of Denham, we are still confronted with the problem of properly labeling and defining our various types of labor activities, and we still find it important to use data concerning the worker making our product as the standard with which we may compare various facts relating to manufacturing problems.

I submit for your thought and consideration in this connection the following:

Productive Labor is that labor which involves physical effort of any nature whatsoever, which produces or tends to produce—

(a) Any change in raw material, finished or semi-finished parts or product in process of manufacture, as to form, character, quality or dimension of such material or product for the purpose of rendering such material or product useful, or preparing it for the subsequent processes or operations tending to ultimate usefulness. Such physical effort may be applied directly, or its application may be through the intermediation of power machinery or chemical or other processes.

(b) Any change whereby a given piece of material, article or structure of any kind is—

(1) increased in value
(2) increased in usefulness
(3) maintained in a practical state of utility.

N. B. The term "manufacture" as herein used refers to all processes commonly known in any industry as direct manufacturing processes and is not limited to the direct manufacturing processes of the particular industry in question.

I feel, however, that such a definition does not satisfactorily solve our entire problem with respect to labor classification. Nor is it to be hoped that any definition along these lines alone will do so. As a result of the misleading character of the results obtained in all our own attempts to divide labor into two major groups such as "productive" and "non-productive," we finally reached the conclusion that any such limited analysis would always be unsatisfactory and that other divisions are necessary. Not sub-divisions of the major ones, but divisions along entirely different lines of cleavage. This second system of grouping comprises three divisions, and we have, because of the aptness of the words, dared to risk the displeasure of cost accountants by using the terms "direct," indirect" and "general" to classify them.

Direct Labor is that labor, whether productive or non-productive, which applies itself directly to the product, the manufacture of which is the primary purpose of the organization, or the labor of non-productive individuals or departments whose efforts are auxiliary to the productive processes of direct productive departments as sole beneficiaries.

Indirect Labor is that labor, productive or non-productive, essential to productive processes other than but supplemental to processes of direct labor.

General: All labor not falling wholely within one of the classifications direct or indirect is classified as general.

Let us now analyze some occupations in order to illustrate the manner in which the definitions will classify our plant labor.

Firemen: In the first place, we place him under the productive grouping for the reason that he changes raw material into energy available for manufacturing processes. That we are justified in calling this raw material for manufacturing purposes is indicated by the definition of the term "manufacturing." The generation of power and even latterly of heat for sale being in a broad sense a manufacturing process. It is readily apparent that in the second classification he is indirect, since he in no wise is personally concerned with direct processes.

Toolmaker: If engaged upon the making of a tool, he is a productive worker. He is not, however, applying himself directly to the main product of the plant, and is therefore indirect—a productive indirect worker. If engaged upon the repair of a tool, he will fall into the same classification, because he is either increasing the tool's usefulness, if it has broken down and is no longer available for productive purposes or maintaining it in a state of utility, if it is still operable but showing signs of needed repairs.

Crane Man: Non-productive because he is not changing any of the items mentioned in the definition as to form, character, quality or dimension but merely as to place and a change in place does not add intrinsically to the value of the part. He may or may not be direct, depending upon whether he is moving articles for purposes of direct production or articles for purposes of indirect production. If he serves the men who build the engines, he is direct: if he serves the men who fire the boilers, he is indirect.

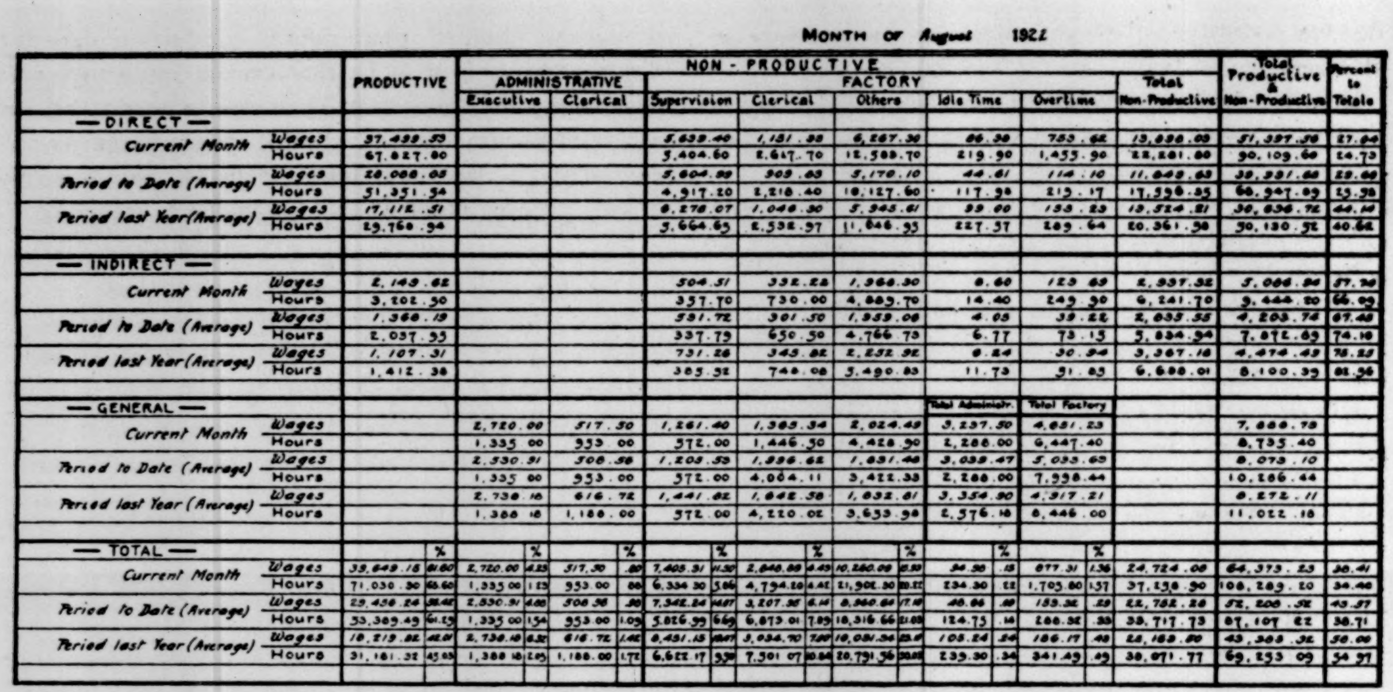
Draftsman: He is non-productive because the work upon which he is engaged does not change material for manufacturing purposes, reference being made to the definition of the term "Manufacturing." The work of drafting is not in any sense a manufacturing enterprise. He may be direct or indirect.

Inspector: He is non-productive if his work be merely the separation of good from defective parts but without any attempt at any time to correct any defects. In some plants it may be that certain inspectors not only inspect the work but touch up or correct all or certain classes of defects. In such a case, the inspector is productive. In either case, if he be an inspector in such a department as tool room, he is indirect; if he be engaged in direct manufacturing departments, he is direct.

Millwrights, painters and carpenters engaged in building articles of asset value for use in the plant or engaged in such work as repairing line shafts, water mains, steam pipes, painting buildings, repairing roofs or partitions, and all similar occupations would be classed as productive indirect labor.

I am anxious that there shall not be created in your minds the impression that there exists a desire on my part to be dogmatic. You may disagree with me very strongly and positively when I say that a toolmaker engaged upon repairing a tool is productive-indirect labor, but it must be borne in mind that in so doing I am not giving you that as an isolated opinion but as a deduction based upon the interpretation of a proposed definition for labor classification. The point of attack, therefore, lies in the definition itself. It would be a waste of time to argue on the question of whether or not a millwright repairing a building is productive, except for purposes of illustration in attacking the rule. As the rule is proposed he is. If he should not be, let us amend the rule and put him where he belongs. I am not primarily concerned in having a definition of such a nature that a man engaged upon a repair operation should be considered as productive, but I am deeply concerned that upon this or some other basis proper labor classification be arrived at to the end that all misunderstandings and ambiguities may, if not entirely eliminated, be reduced to the irreducible minimum.

And further, I am not particularly concerned with the words which are used as classification headings. If productive and non-productive are not acceptable, let us use something else that is better—for example, "Operative" and "Non-Operative," and if direct and indirect are too well established in the terminology of cost accounting, let us use something in their stead, such as, for instance, "Manufacturing" and "Supplementary." Under the one method of terminology, the definitions would as easily classify our labor as under the other. I would at this point, nevertheless, like to say a word in defense of the direct and indirect terminology. As has been indicated, the words apply primarily to that labor directly chargeable or not directly



MONTH OF August 1922

		PRODUCTIVE		NON - PRODUCTIVE																
				ADMINISTRATIVE				FACTORY										Total	Total Productive &	Percent to
				Executive		Clerical		Supervision		Clerical		Others		Idle Time		Overtime		Non-Productive	Non-Productive	Totals
— DIRECT —																				
Current Month	Wages	37,499.53						5,639.40		1,151.98		6,267.30		86.30		753.62		13,898.03	51,397.56	27.04
	Hours	67,827.80						3,404.60		2,617.70		12,503.70		219.90		1,455.90		22,281.80	90,109.60	24.73
Period to Date (Average)	Wages	28,088.05						5,604.89		909.63		5,170.10		44.61		114.10		11,843.63	39,931.68	29.66
	Hours	51,351.34						4,917.20		2,218.40		10,127.60		117.90		213.17		17,596.35	68,947.09	25.52
Period last Year (Average)	Wages	17,112.51						6,278.07		1,048.30		5,945.61		39.00		133.23		13,524.81	30,636.72	44.14
	Hours	29,760.94						3,664.65		2,532.97		11,646.95		227.37		289.64		20,361.58	50,130.52	40.62
— INDIRECT —																				
Current Month	Wages	2,149.62						504.51		332.22		1,968.30		8.60		123.69		2,937.32	5,086.94	57.74
	Hours	3,202.50						357.70		730.00		4,889.70		14.40		249.90		6,241.70	9,444.20	66.09
Period to Date (Average)	Wages	1,368.19						591.72		301.50		1,959.08		4.05		39.22		2,835.55	4,203.74	67.48
	Hours	2,037.33						337.79		650.50		4,766.73		6.77		73.15		5,834.94	7,872.69	74.10
Period last Year (Average)	Wages	1,107.31						731.26		345.82		2,252.92		8.24		30.94		3,367.18	4,474.49	75.25
	Hours	1,412.38						385.32		748.08		5,490.83		11.73		91.83		6,688.01	8,100.39	82.56
— GENERAL —														Total Administr.		Total Factory				
Current Month	Wages			2,720.00		517.50		1,261.40		1,385.34		2,024.49		3,237.50		4,651.23			7,888.73	
	Hours			1,335.00		953.00		572.00		1,446.50		4,428.90		2,288.00		6,447.40			8,735.40	
Period to Date (Average)	Wages			2,530.91		508.56		1,203.53		1,896.62		1,831.48		3,039.47		5,033.63			8,073.10	
	Hours			1,335.00		953.00		572.00		4,064.11		3,422.33		2,288.00		7,998.44			10,286.44	
Period last Year (Average)	Wages			2,738.18		616.72		1,441.82		1,842.58		1,032.81		3,354.90		4,317.21			8,272.11	
	Hours			1,388.18		1,188.00		572.00		4,220.02		3,653.98		2,576.18		8,446.00			11,022.18	
— TOTAL —			%		%		%		%		%		%		%		%			
Current Month	Wages	39,649.15	61.60	2,720.00	4.23	517.50	.80	7,405.31	11.50	2,848.89	4.43	10,260.09	15.93	94.90	.15	877.31	1.36	24,724.08	64,373.23	38.41
	Hours	71,030.30	65.60	1,335.00	1.23	953.00	.88	6,334.30	5.86	4,794.20	4.42	21,902.30	20.22	234.30	.22	1,705.80	1.57	37,258.90	108,289.20	34.40
Period to Date (Average)	Wages	29,456.24	56.42	2,530.91	4.88	508.56	.98	7,342.24	14.07	3,207.36	6.14	8,960.64	17.16	48.66	.09	153.32	.29	22,752.28	52,208.52	43.57
	Hours	53,389.49	61.25	1,335.00	1.54	953.00	1.09	5,826.99	6.69	6,873.01	7.89	18,316.66	21.03	124.75	.14	288.32	.33	33,717.73	87,107.22	38.71
Period last Year (Average)	Wages	18,219.82	42.01	2,738.18	6.32	616.72	1.42	8,451.15	19.07	3,034.70	7.00	10,081.36	23.24	105.24	.24	186.17	.43	25,183.80	43,383.32	58.06
	Hours	31,181.32	45.05	1,388.18	2.03	1,188.00	1.72	6,622.17	9.59	7,301.07	10.84	20,791.56	30.03	239.30	.34	341.49	.49	38,071.77	69,253.09	54.97

Fig. 1. Form of Pay-Roll Analysis.

chargeable to the product as the case may be. Recently there has been the suggestion made (Denham) that we speak of them as chargeable and non-chargeable, and to my mind this is the truly simple and logical way of defining labor for cost purposes. Such a plan leaves to the words their most important and most obvious meaning, removing only that limitation (chargeable or non-chargeable) which cost accountants found it necessary to impose. Varying opinions as to the extent one could or should *charge* labor would in no wise effect the question of the *directness* or indirectness of that labor.

From the standpoint of costs, it will be found that this method of analysis does not introduce any difficulties whatsoever. For example, a productive indirect worker, such as a toolmaker, may be charged directly to a job, such as the manufacture of a tool, and another toolmaker directly to an expense, such as tool repairs. Furthermore, it has the advantage that should there in any department be a class of productive direct workers, who, for one reason or another, cannot be allocated or directly charged to the work in process, it is nevertheless possible to show them in their correct classification on the analysis sheet.

There is one other matter to which I desire to call your attention. As matters now stand, serious discrepancies may be introduced for comparative purposes, depending on whether or not, for instance, one of us calls a millwright, under certain circumstances, productive and another calls him non-productive. The importance of the error lies in the fact that we get different results in the matter of our productive labor. Under the scheme proposed, however, the error is minimized, since while we may disagree as to productivity, we cannot but agree on the question of directness or indirectness, and we would both, therefore, keep him out of direct productive data.

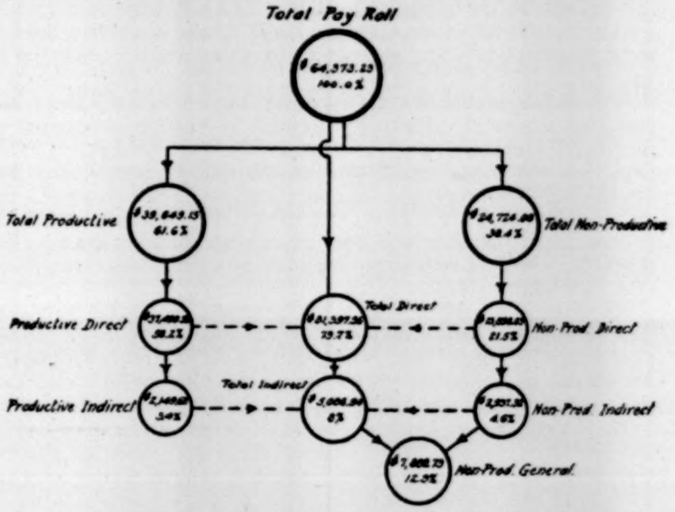
The form of "Pay Roll Analysis" shown (Fig. 1) will serve to indicate one of the many varied ways in which information may be obtained by this system. It is to be understood that this is offered merely by way of illustration and that the figures given are fictitious. It may be made more comprehensive, or it may be greatly simplified depending on the requirements of the particular business. For example, instead of showing hours and wages alone, numbers of workers might also be included. Such headings as "Supervision" or "Other" might be still further divided for purposes of analysis. It might be condensed by putting "Clerical" and "Other" in one column, and it might merely show number of employees without any reference to wages or hours. Auxiliary sheets for purposes of more detailed consideration can easily be prepared by departments or under such suitable division as might be desired. From the form shown, however, it is apparent that very considerable information may be derived as to the relative wages paid to or hours worked by the groups indicated. Not only may we test non-productive wages or hours against the grand total but we may also find what relation each division "Direct," "Indirect" and "General" bears to the total. Each manufacturer and each executive interested in "Pay Roll Analysis" can easily determine for himself what data he is particularly interested in and arrange to suit himself the form in which it is presented.

It will be observed that hours are credited to each division just as are wages or salaries. The purpose of this is to eliminate the likelihood of incorrect conclusions being drawn from insufficient data. For instance, if we were comparing a certain month with an earlier one, the former being a part time month and the latter a full time one, all other things being equal, the ratios obtained in each month would be identical, if our ratios were based on numbers of employees. As soon as we obtain these ratios on the hour basis, however, we find that there is a marked difference as between the two periods. Total earnings may also be misleading. Average earnings or wages are of value not only because the ratios resulting are fairly accurate and comparable but also because the actual values in themselves should give illuminating information.

The manner of arriving at the number of hours is a very simple one. All those working on clock cards are credited with the hours shown on the cards; all those on the weekly or monthly basis of pay and not working on clock cards are credited with the theoretical hours which they are supposed to work, no consideration being given to overtime or absences, unless in the latter case a deduction from pay is made.

That the principle of the scheme is in itself very simple, should be readily apparent. Once the definitions are understood, there need be no further concern as to the ability of the Pay Roll Department to properly analyze the pay roll, or any difficulty on the part of the executives in understanding the information presented. The use of the terms "Productive" and "Non-Productive and "Direct" and "Indirect" are so easily comprehended that once we appreciate the method of their application and forget the manner in which they have been used by cost accountants, we can almost classify our labor without thought of definitions. Once you get the basic idea in your mind, you immediately visualize a certain group of workers when you hear the term "Direct Productive," and the same is true of "Indirect Productive" or any other group.

I am fully convinced that the only satisfactory solution of the problem of labor classification for pay roll analysis is upon what I might term vertical as well as horizontal lines of demarcation. If we accept this theory, we have then only to finally determine the exact definitions for the various divisions, whether they be those proposed above or others. In any event we can and should achieve a common plane of understanding to our inestimable benefit and advantage.



NOTE

The above chart will serve to illustrate the principle of this method of "Pay Roll Analysis," as well as to suggest a simple way in which the major facts of analysis may be presented clearly. It will be observed that Productive Direct and Indirect equal Total Productive, and that Non-Productive, Direct, Indirect and General equal Total Non-Productive. These two added together equal the total Pay Roll. In like manner Total Direct, Total Indirect and General added together equal total Pay Roll. It is apparent, therefore, that we not only get clearly our totals under the Productive-Non-Productive and Direct-Indirect-General classifications but also the compound groupings resulting from sub-analysis, such as Direct Productive, Indirect Productive and so on.

Fig. 2. Illustrative Chart.

DISCUSSION

Mr. C. F. Brown stated that it seemed to him that the problem could be divided into three distinct phases, as follows:

1. Is the present form of payroll analysis satisfactory, i. e., should the present definition of what is productive and what is non-productive be continued?
2. Does the idea or general principle of method of payroll analysis submitted appeal to the members present as putting things in a clearer light than the ordinarily accepted terms?
3. Question of definitions.

Mr. E. F. Papworth of the Brown-Lipe-Chapin Company stated that he personally had long been dissatisfied with the terms "productive" and "non-productive," and "direct" and "indirect," as used by cost accountants, and felt that the terms "chargeable" and "non-chargeable" were preferable because they were ordinarily the determining factor between productive and non-productive labor in the cost installation. Mr. Papworth cited the instance of an inspector who has pieces coming to his bench for inspection and who is just as necessary to production as a machine operator, but that due to the large variety of parts which he may inspect, it is impossible to charge his time directly to any blue print or operation number, and that, therefore, there is no alternative to charging his time to expense in most cases.

Mr. Papworth asked Mr. C. F. Brown, for the benefit of the assembly, to assume that his business was in a bad way financially due to business depression, necessitating the immediate cutting down of expenses, and to illustrate through his scheme of payroll analysis what class of workmen should first be dispensed with.

Mr. Brown (illustrating by means of charts) stated that the figures given in his chart were not to be taken as real. Mr. Brown went through the reasoning which he would use in trimming down his payroll in case of its being desirable for any cause to reduce overhead. He brought out that the departments made up chiefly of indirect non-productive workers would be the first to be curtailed, giving as his reason that it would be possible to produce and sell goods without an Accounting Department, Cost Department, etc., and without clerks employed for the purpose of making up reports, but that it was not possible to get along and produce and sell without a certain amount of direct operators, tool makers, and a service department to keep tools and equipment in order and in condition to use.

Mr. Brown stated that in the last issue of *Factory* there had appeared a number of articles written by various executives of important industries on "What Are the Most Important Problems for the Year 1923," and stated that a great many had emphasized the necessity of reducing overhead expense, and that at least two of these executives had written about the necessity of reducing the cost of non-productive labor. The point Mr. Brown was bringing out was what was meant by "non-productive" labor.

Mr. Griffin of the Rome Manufacturing Company remarked that it was his belief that one of the big values of a payroll analysis is to enable an executive to analyze his own payroll and make a comparison with some previous period, not only making a comparison of his own payroll against different periods but comparing same with that of other plants of a similar nature. Mr. Griffin stated that in the segregation of productive and non-productive labor, there is bound to be a great difference due to the nature of the product manufactured by the plant or establishment; that in certain plants the percentage of non-productive labor would be greater than in other plants because of local conditions. Mr. Griffin asked if it was possible to arrive at 100 per cent. efficiency in making this comparison, and also asked if an executive would not be very much misled if he analyzed his payroll on the basis of Mr. C. F. Brown's chart and compared it with the payroll of another plant where the business was entirely different and the percentage would be entirely different.

Mr. Brown said that Mr. Griffin had suggested one of the important reasons for reaching an agreement, but that he would like to ask Mr. Griffin how he would make a comparison under existing conditions and methods; that at present there are only productive and non-productive, whereas the chart went further. Mr. Brown stated that comparisons would always be difficult, but that some definite understanding should be arrived at, so that it would be possible to segregate the effects of peculiar local conditions in order to arrive at a basis of comparison. Mr. Brown submitted the instance of the Corona Typewriter Company maintaining its own print shop for turning out its own factory and sales forms, stating that in another typewriter factory located in a larger city this same expense would appear as "purchased expense materials," and that the new payroll analysis would serve to segregate such items as printers' wages in this case and permit of a comparison of the two typewriter factories more nearly on the same basis, and that, therefore, any comparisons which can be made now would be made much clearer by the new system. Mr. Brown pointed out that the chart as made out applied to only one product, but that where two or more products were made the productive labor column could be divided, if desired, into as many parts as there were varieties of product.

Mr. Ewell of the Auburn Button Company brought forth the idea of, in the first place, a man running a machine and being forced to deliver the pieces to his machine and take them away from his machine himself; and, in the second place, providing a helper, say a cheap boy, to do this work for him. Mr. Ewell's thought was that by employing a helper the operator would be enabled to turn out more pieces per day at less cost as far as the operation itself was concerned, and wondered if it would be possible to show, by dividing labor this way, where the productiveness of the plant had been increased or the productive labor account bettered by the increase in indirect labor.

Mr. C. F. Brown in reply to Mr. Ewell stated that his payroll analysis would not show that; that Mr. Ewell's problem was a matter of cost; that the chart would show that his productive labor was decreasing in proportion to production and that indirect productive would show an increase.

Mr. Andersen of the Bowen Products Company remarked that the problem to him was a deep one, but that it was his thought that the terms "chargeable" and "non-chargeable" were better than the terms at present used, but that the whole proposition boiled down to who is going to make and use the analysis, i. e., who is going to decide what is productive or non-productive, or direct productive or indirect productive, etc. Mr. Anderson felt that many industries were already loaded with comparisons which do not mean much on account of the lack of satisfactory adjusting factors for various levels in wages and the cost of living in various periods or places.

Mr. Andersen continued, citing the problem of the Rome Manufacturing Company, which manufactures 4,000 different articles of which there are 12,000 component parts, in applying this chart for comparative purposes against a chart made up by an automobile or typewriter manufacturer. Mr. Andersen agreed that the terms "productive" and "non-productive" as used were loose, but believed they were used because it is the easiest way to classify, and wondered if ordinary clerical help could be depended upon to make correct analysis under new system. The problem to Mr. Andersen was "Now that we have this chart what are we going to do with it?"

Mr. Percy S. Brown partly answered Mr. Andersen's questions by saying that the Corona Typewriter Company was using ordinary clerical help in the analysis of their payroll, and that once the defining of various operations or occupations was disposed of this form of payroll analysis is not at all complicated.

Mr. P. S. Brown also called attention to the fact that Mr. C. F. Brown had mentioned in his paper that a ratio column could be added to the chart, which would indicate whether or not rates had been reduced. As Mr. P. S. Brown sees it, this chart is for the benefit of the factory manager and superintendent, rather than for the general manager and board of directors, who are primarily interested in the total amount of business.

Mr. C. F. Brown felt that no plan would fully meet all abnormal conditions, and that even in cost statements there is not one that tells the whole truth. He believed that there is a real comparison, if the wages of men are not used, in hours worked. It was also his belief that Mr. Andersen was satisfied with the use of the terms "productive" and "non-productive," and he stated that he also would like to retain the use of these terms, but asked that it be defined as to what is meant by productive and non-productive. Mr. Brown brought out that he was not attempting to destroy a theory which had been in vogue but merely went farther in his definitions.

Mr. Andersen, speaking further on the clerical help necessary to do this, stated that he should have asked if ordinary clerical help was competent to do this analyzing in a business which was constantly changing, and that at the Bowen Products Corporation there is a card system defining what is productive and what is non-productive as far as payroll analysis is concerned, but that he does not know of anyone who has attemped to define these on a common ground.

Mr. Bateman of the Auburn Woolen Mills would like to see a payroll analysis such as this connected up with cost, and said that to him it would not be of any value unless it was connected up with cost. Mr. Bateman believed that Mr. Brown had made this payroll analysis for his own board of directors, and that it must be concluded, therefore, that such a form of analysis, so far as general application was concerned, is only of academic interest.

Mr. C. F. Brown did not agree with Mr. Bateman, stating that such a report from the payroll department would tie up with cost through the same information which goes to the cost department. In other words, a man has spent a certain amount of time on an operation, in which case this is automatically thrown into direct productive hours. In the case of a toolmaker a charge is made against the manufacturing of a tool, i. e., the payroll department shows him as indirect productive and the cost department posts his time against the cost of that tool, and in the same way a toolmaker making repairs to tools is shown. Costs are handled in the same way and reports come in in the same way. Analysis is made in the payroll department and the cards would pass on to the cost department.

Mr. Bateman said that he had often studied a chart of this kind and had wished that it would show him where the cost of an article was too high; that such charts were history, and that he would like a chart that would tell him something beforehand.

Mr. P. S. Brown in reply to Mr. Bateman referred him to his labor cost and expenses, stating that his rate department does some of this by determining rates and the best method for handling the job and that the chart is merely an auxiliary to this.

Mr. P. S. Brown, as an illustration of the lack of a common ground for defining terms, referred to a meeting of the Taylor Society in New York some time ago, at which time he had been asked what the ratio was of direct to indirect labor at the Corona Company. When Mr. Brown asked the questioner to define direct and indirect he was unable to do so.

Mr. E. F. Papworth believed that there was a feature of this chart which seems to have a direct connection with cost, i. e., in the case of typewriters you could take the number of hours worked and divide by the number of machines assembled and shipped, and in this way make comparison from time to time.

Mr. C. F. Brown said that this report could be made up for any period desired, i. e., weekly, monthly, etc., or certain classes of information every two or three weeks or months, and that Hollerith sorting machines were used in classifying.

Mr. P. S. Brown did not believe that there was a bit more work involved in this method than in the old method aside from the recapitulation of the data.

(*Continued from page* 45)

work turned out. To get maximum results from this appeal, it follows first that facilities in the shop must be such that he *may* if he desires produce a big day's work, and second that he be in a frame of mind where he will *want* to produce. Bringing both of these conditions to pass is distinctly a management duty, and until the management has seen to it that its part is fully played, the incentive appeal will meet only half-hearted and temporary response in that even the 25 per cent may be withheld by the workmen due to lack of confidence thus created.

Henry H. Farquhar.[1]

---

[1] Harvard Graduate School of Business Administration.

SPRING MEETING

Hotel Onondaga, Syracuse, June 7-9

See page 43 for program

WASTE OF MATERIALS

By H. M. Sutton[1]

THERE has been much comment and discussion of "Waste In Industry." One important phase of waste however has not been given adequate attention in the technical press or discussions, nor is it at all emphasized in the report by Mr. Hoover's committee made in 1921. We refer to waste of materials.

Reduction of waste through standardization of sizes and specifications has made great progress. This work has been fostered by various engineering societies and has lately received further impetus through the Department of Commerce and the United States Chamber of Commerce.

Saving waste through utilization of by-products has been the study of chemical engineers for several decades and some remarkable results have been attained.

But the more careful utilization of those materials themselves which form the basic cost factors in several industries has apparently received careful attention in only a few plants.

As managers and management engineers we are perhaps too prone to emphasize most the gains to be made through mechanical improvements, wage incentives, and better coordinated management. The facts will bear out, however, that a much more careful analysis of the utilization of materials in manufacturing should be made.

The experience of engineers with whom the writer has been associated has demonstrated that avoidable waste of materials in several industries is a very important factor in high factory costs. Materials frequently equal or exceed in cost the total direct labor expended on a finished product. In some industries the cost of purchased materials amounts to more than all the other costs of running the business. Any reduction in waste percentage is therefore important.

Material waste is of two classes—avoidable and unavoidable—but in few plants is any distinction made between the two. Waste (i.e., some waste) is a necessary and ever present evil. Consequently if the waste figure does not vary by a very marked amount it receives little attention in the average factory.

A careful analysis of the waste made, the reasons for it, and the possibilities of improvement will almost invariably show possibilities of saving. Wood-working wastes are frequently susceptible to reductions of 10 to 20 per cent (of total lumber used)—in some instances as much as $50,000. per year saving. In knitting mills the cutters are seldom as economical as they should be, and while wastes may not run more than 6 to 18 per cent of the total cost of knitted cloth, if the waste average is reduced only 1 to 2 per cent this may amount to $5000 or $8000 a year. In one mill making a high-priced product, cloth saved through waste reduction has run as high as $33,000 per year. Any plant manufacturing leather has an important waste problem. One of these making an inexpensive shoe has found it possible to pay its girl cutters as high as four to six dollars per week for waste reduction alone, and this with a greater factor of the saving to the company than to the employees.

---

[1] Conley & Marvin Company, Louisville, Ky.

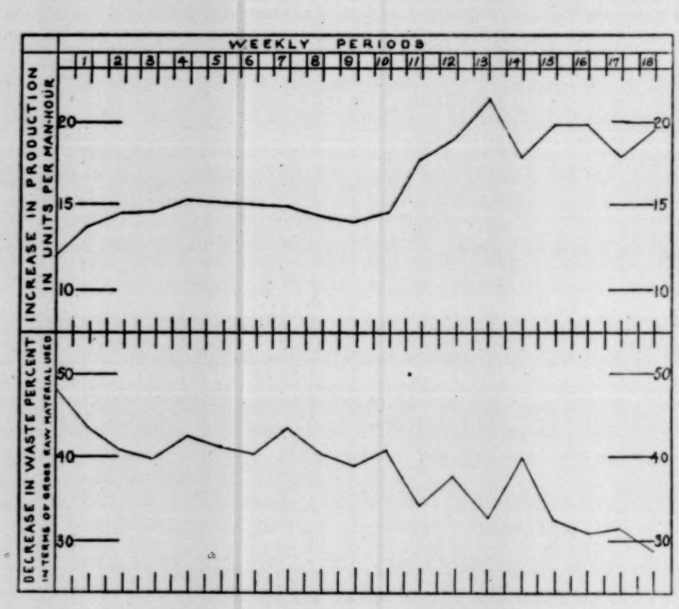


Fig. 1. Economies in Use and Cutting of Lumber.

There is another advantage to waste control in addition to the direct savings it can accomplish. Not infrequently departments where waste is a big factor are operated entirely on day work because it is anticipated that an incentive for greater production would make for faster work at the expense of greater waste, resulting in a net loss to the company. However, when the waste problem is thoroughly understood and proper standards established, production can also be safely increased by the use of incentives. Operatives can be held to strict accountability and no extra earnings paid for increased production unless waste is maintained at the same point or decreased. Frequently a combination incentive can be applied so that pay goes up in proportion as waste is decreased and production increased.

There are few manufacturing plants that can not increase their earnings and contribute to the reduction of waste in industry by the proper attack on this problem.

REVIEWS

Mastering Power Production. By Walter N. Polakov, Engineering Magazine Company, New York, 1921; 455 pp.

Books dealing with power plant practice usually cover either the technical or the commercal phases of the power generation problem. "Mastering Power Production" is principally an exposition of the philosophy involved and especially as applied to economic questions and to the relationship between the men who perform the labor and the men who control the capital and own the resources utilized in the process.

The introduction is an outline of the author's theory of production in general. This theory is best expressed in the author's own words as follows:

"During the past few years it became unmistakably clear that production carried out for profit only ruins itself in the long run and that the business that reckons with social requirements and meets the needs of society receives the highest reward."

Chapter I describes the power industry of the United States, the enormous growth of which in the last century the author attributes to three items: "Democratic Cooperation," "Realization of Importance of the Time Factor" and to "Electrical Energy or Power." The burden of this chapter is that "destructive competition" should be eliminated, and cooperative production is offered as the ideal substitute, i. e., cooperation between power properties and between capital and labor. "The Principles of Administrative Management and Operation will determine the success or failure of the undertaking." The main point in this chapter is waste and the argument that the present economic system makes waste necessary and therefore is a "System that makes commodities dear and men cheap." The author's answer is that this system will eventually destroy itself from within and that the only remedy is "a new mode of mastering production," and it follows logically in the author's mind that new principles and methods must be developed and practiced. A discussion of "Management" follows, further outlining how best to better production and thus place the practice of power generation on a sounder economic basis.

Chapters II and III cover "Location of Plants" and "Equipment of Plants." In these two chapters again the economic phase is stressed. The chapter on plant layout covers item by item the factors which must be considered, and suggestions are offered as how best to solve the problem. Emphasis is laid on arrangement for safety to the operators, and for convenience to assist in bettering operating conditions. Examples of faulty design are noted in numerous illustrations given of details such as gauge boards, safety treads and walk-ways, and special tools for performing special work.

The main division of this chapter might be entitled "Economic Conception," and therein the author gives numerous illustrations of engine and boiler efficiency tests and overall plant economy results designed to show present practice and comparative results between the better and the poorer plants. This chapter is summarized by the author when he again brings to the forefront his argument for "Management" by saying that to gain the correct conception of the value of the plant both for investors and the public one should know more than its physical properties—"a valuation should be made of the mode of its use, and that is primarily the method of its operation."

Then there follows four chapters relating directly to the title of the book, as follows:

"Mastering Material," "Mastering Maintenance," "Mastering Labor Problems," "Mastering Labor Compensation."

The first two of these chapters deal with technical engineering subjects from an economic viewpoint. A distinction is made between price and use value and numerous arguments given for placing the choice and purchase of material in the hands of the Production Department, otherwise, in general, the "engineering management." The relative value of coal determined by service test is brought forth as the most obvious example of the desirability of the above practice. Methods for handling material and for accounting therefore are discussed and examples and illustrations used to prove the point. The relation between maintenance and efficiency is noted by curves and examples and argument made that adequate attention to proper records and scientific scheduling of maintenance will promote efficiency in power plant practice. The second two of these chapters covers the labor problem from two viewpoints: first, the underlying philosophy, and second, the author's ideas as to the proper methods to follow in directing and paying for labor. The working day, the subject of fatigue, the theory of individual labor and the relation of the engineer to the laborer are among the items covered by this exposition of philosophy.

The basis of wages, incentive payments, profit sharing, premium plans, two rate wages, indicate the thoughts which the author offers in the second part. The brief review of the work of Taylor, Emerson and Gantt is followed by a description and charts showing the methods used by the author in his work of introducing management engineering methods into power plant practice. The basis of the author's scheme of payment for labor is a two-rate wage, adjusted for conditions beyond the control of the men involved and determined quantitatively by facts arrived at by proper installation and use of measuring instruments. It is claimed for this scheme that it results in profit both to the man who performs the work and to the payer of the wages. Such profit follows from the fact that the product of the efforts of the laboring man are determined and payment therefor made in proportion to the quantity and consequent value of the labor.

The eighth chapter, "Mastering Processes," gives examples, illustrations and charts showing, in considerable detail, the author's methods of management as applied to power plants. Pictures of instrument boards, outlines of steps in investigation made to determine the facts and show the losses, charts showing methods of graphic representation and calculation of facts and instruction cards giving the results of such investigations, occupy the principal part of this chapter. To an engineer interested in the details of power plant arrangement and routine operation the details covered in this chapter are illuminating and well worth careful consideration.

"Mastering Records" contains numerous samples of log sheets and description of methods used to analyze and summarize the facts so collected. A description and picture of a "Power Plant Log Calculator" is included. This chapter leads logically into Chapter X entitled "Analysis of Expenses," wherein the methods used to transform engineering data into dollars and cents understandable to the business executive are explained. Standard operating cost curves are given as examples with which comparisons may be made of actual performance. Such items as machine utilization and cost of idleness are discussed and their effects upon power production analyzed. Classification of costs, graphic cost records and methods of showing costs of purchased or manufactured power are explained in detail.

The last chapter is entitled "Power as a Commodity," and covers the history of the power industry. The burden of the entire chapter is the possibility of more complete utilization of our natural resources by the more extensive recovery of by-products from coal, the more extensive electrification of the railways, by less wasteful methods of mining coal, and further development of our hydro-electric resources.

The entire book is given over to a discussion of the best means to master power production and the need for this mastery is best expressed in the author's words as follows:

"We need no new inventions, no new machinery, to eliminate a fabulous proportion of losses incurred to-day due to lack of co-ordinated knowledge, cooperation and managerial ability, and intelligent mastering of power production for the benefit of the community is alone capable of conserving three-quarters of our power resources, increasing the productive capacity and the wealth of the country almost beyond conception."

In conclusion, this book is not for the technician but for the engineer who wishes to obtain a broader view of power engineering and at the same time has enough experience with the realities of the business to sift the ideal from what is at present practical. The book reflects the theories of a school of efficiency engineers and applies these ideals to the power industry in a manner which, while perhaps not commercially practicable at the present time, is nevertheless illuminating and inspiring to any power engineer who is not totally absorbed in technical details.

ALFRED IDDLES.[1]

The Twelve-Hour Shift in Industry. By Committee on Work-Periods in Continuous Industry of the Federated American Engineering Societies. E. P. Dutton & Co., New York, 1922.

Prepared by a committee of the Federated American Engineering Societies, "The Twelve-Hour Shift in Industry" will no doubt have a wide reading by members of the specifically engineering professions. But it should find a far wider audience. It is important as the first comprehensive inquiry into the extent of the anachronistic twelve-hour day in continuous industries. It is important as demonstrating that in the steel industry especially the twelve-hour shift is without valid technical or economic excuse. Above all it is important because through it the engineers as a body have declared their independence of those professional taboos which have hitherto kept them too discreetly aloof from great social and ethical controversies such as that which for more than a generation has raged about the twelve-hour day in steel.

For while the volume under review deals at length with the strictly technical phases of the problem involved in the change from the two-shift to the three-shift system, its acknowledged inspiration is ethical and social. "The desirability of abandoning the two-shift system," the engineers say, "lies not in the extent to which it is used but in the fact that the twelve-hour shift day is too long when measured by twentieth century ideas as to the proper conduct of industry. Decisions are influenced to-day by humanitarian considerations as well as by the economic demand for that length of a day which will in the long run give maximum production." And as if aware that what they have thus said runs counter to the traditional etiquette of their profession, they hasten to add: "This declaration the Committee believes is not controversial."

While acknowledging their indebtedness to such studies as the Interchurch Report, whose finding with respect to hours and wages their findings in the main confirm, the engineers have taken nothing for granted. They approached their problem with a healthy measure of scientific skepticism. They not only went into the facts as to the extent of the twelve-hour day in steel, with which the Interchurch Report was exclusively concerned, but they also surveyed the entire field of some forty or fifty continuous process industries in which the two-shift system survives. This general inquiry they assigned to Dr. Horace B. Drury, whose earlier study, "The Three-Shift System in the Steel Industry," was published in the February, 1921, issue of the *Bulletin of the Taylor Society;* the special section devoted to the iron and steel industry, they entrusted to Mr. Bradley Stoughton, Chief of Cost Statistical Division, American Steel and Wire Company, and formerly secretary of the American Institute of Mining and Metallurgical Engineers.

For the purposes of his investigation, Dr. Drury arranged the continuous process industries under four group headings: I. Heat-process industries; II. Chemical industries; III. Heavy equipment industries; IV. Service industries. "It would be hard," he observes, "to overstate the technical importance of the continuous industries. Our contact with their products is as intimate as our knowledge of the breakfast table—as witness *sugar* and *salt*, the *breakfast food, bread*, the *silver* on the

---

[1] Chief Power Engineer, Day & Zimmermann, Inc., Philadelphia.